Southern Power & Industry

Industrial and Power Journal of the South and Southwest

JUNE 1960







A Special Reference Section

Engineering — Operating — Maintenance

ORIFICE METERS - - - - SEE P. 37





ROBVON **BACKING RINGS**

SIMPLIFY

PIPE WELDING IN ADVERSE FIELD CONDITIONS

FAST-EASY-FIT-UPS

TYPE CCC

Designed for quick easy alignment of pipe where the variation in inside diameters is relatively great. Chamfered NUBS allow close tolerance fit-up and CLEAN STRIKE OFF. The ROBVON

NUB automatically sets root gap. ROB VON rings are beveled to assure nonrestricted fluid flow



TYPE CC

Designed to allow quick easy alignment of pipe where the incide diameters are slightly



out of round. The welder has the choice of "STRIKING OFF" the NUBS or leaving them intact to be melted into the weld mass of the first roof

TYPE C

Designed for precise close tolerance fit-up. Type "C" NUBS automatically sets root gap. The NUBS melt with the metal to give com plete penetration and

PLAIN TYPE

Rings have flat outer surface with beveled internal edges and flat inner land.

MACHINED RINGS

Robvon also manufactures machined rings to customer's specifications. All fabricated solid machined rings x-rayed.

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Volume 78

Number 6



DON'T SETTLE FOR LESS! Clarage makes sure you get *extra* service life on those punishing induced draft applications.

The Type DN Dynacurve fan, when equipped with wearing plates, has these abrasion-resisting steel plates welded to the face of the wheel blades. A distinguishing Clarage feature that guarantees you less maintenance, longer operation! But that's not all.

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CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES . IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

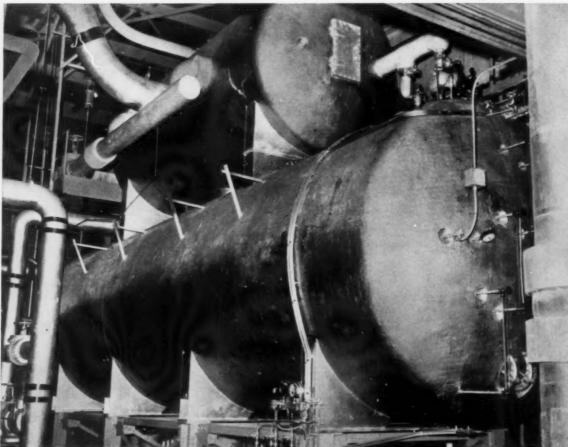
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ALLIS-CHALMERS





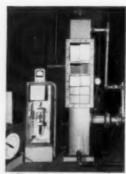
Allis-Chalmers horizontal tray-type deaerator in a large central station, approximately two million pounds per hour capacity

Iron and Copper pick-up minimized

when you switch to Allis-Chalmers deaerators

Positive corrosive gas removal by Allis-Chalmers traytype deaerators is proved by a pilot unit (below) equipped with a continuous oxygen analyzer and recorder. It utilizes unique counterflow design for thoroughly scrubbing dissolved gases from the water surface. Design produces maximum heating of water with minimum of steam loss in venting. Effective deaeration is guaranteed under all loads, minimizing iron and copper pick-up.

Ruggedly constructed, A-C deaerators employ 16-gauge 18-8 stainless steel on all equipment exposed to corrosive gases. No moving parts assures quiet operation, minimum maintenance. Inspection is easy through ample access doors and manholes. Service? Seventy-seven district offices throughout the nation. Your A-C water conditioning engineer can give you full deaerator details. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Pilot deaerator permits



Allis-Chalmers deaerators may be installed indoors or outdoors.

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NEP

Southern Power & Industry

The Industrial and Power Journal of the South and Southwest

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Engineer in large Florida processing plant gives round-up of accepted installation and maintenance recommendations. He gives specific tips for measuring flow in your plant: Meter Piping, Pressure Taps, Flanges, Orifice Plates, Orientation, Recorders and Transmitters.

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Facts and Trends

June 1960

BRIGHT ALUMINUM - Reynolds Metals Company has developed "the brightest, most corrosion resistant aluminum alloy ever made available."

> Immediate applications for the durable alloy with the mirrorlike brilliance cover all interior and exterior trim uses in automobiles plus a myriad of uses in the appliance industry. Alloy 5657 is a high-purity, non-heat treatable metal. It may be formed in all tempers as easily as alloy 5457 presently being used widely in the automotive industry.

♦ SEA WATER DISTILLATION - Cleaver-Brooks Special Products has been awarded the contract to provide six sea water distillation units and three contaminated water boilers for three new-type cargo vessels being built by Avondale Marine Ways for the Mississippi Shipping Company, both of New Orleans.

The contract calls for two two-stage flash evaporators for each vessel. Each unit will be capable of producing 9,250 gallons of fresh water from sea water every day. The contaminated water boilers will operate on a closed system providing steam for certain auxiliaries.

◆ AREA DEVELOPMENT - A research project designed to create 30,000 jobs and \$120 million in new annual industrial payroll in the Norfolk and Western Railway Company's traffic area has been announced by Stuart T. Saunders, president.

The fact-finding project will take two years to complete, and is fundamental to the N&W's goal of diversifying its revenue sources and improving the economic base of the area the railroad serves. It is expected to help implement an aggressive new program to bring appropriate industries into Virginia, West Virginia, Ohio, North Carolina, Maryland, and Kentucky.

♠ MAGNETOHYDRODYNAMIC - Scientists of the Westinghouse Electric Corporation have unveiled a major step in the continuing search of new direct methods of electric power generation. They have demonstrated the first magnetohydrodynamic (MHD) generator of appreciable size to produce electric power continuously from the combustion of a conventional fuel.

The MHD generator produces electric power by passing a superhot, electrically conducting gas — a plasma — between the poles
of a powerful magnet. This ionized gas, which substitutes for
the copper wires in the rotating coils of a conventional electric generator, passes through a ceramic-lined tube at 1,800
miles an hour, cuts across the magnetic field of the magnets
and produces electric power. Operating at about one-fourth
its full power rating, the new generator has produced 2½ kilowatts of power and has run continuously for four minutes.

◆ PLASTICS - Heretofore, whenever Commercial Plastics & Supply Corp. has issued a new catalog, the book had a "life" of at least two years. Its 1959 catalog proved so popular, however, the 30,000 copies were exhausted before the end of the year. Commercial de-(Continued on Page 6)



PACKAGE AIR PREHEATER

Fuel savings alone pay for it in two years; installation costs cut by preassembly —

Savings come in pairs at Clearwater Finishing Co., with the installation of their new Package Air Preheater. This is why:

1. Initial savings on installation. You can install a Package Air Preheater at a fraction of the expense required for conventional heat recovery equipment. The unit you see in the picture is a complete Package Air Preheater. To put it into service you simply lift it into place, make power and duct connections. It's that fast, that easy.

2. Long term fuel savings...\$17,000 a year off your fuel bill (more or less, depending on size of preheater and application). What you save on fuel can pay for the Package Air Preheater within two years.

Installation savings are achieved through standardized design, which permits complete shop assembly. Fuel savings are achieved through the efficient continuous regenerative heat recovery principle, which cuts your fuel bill 1% for each 45-50°F increase in preheated air temperature.

For application ideas, and facts and figures on the potential savings, write for free 14-page booklet.

Completely pre-assembled Package Air Preheater is lifted into place at the new plant of Clearwater Finishing, (Division of United Merchants & Manufacturers, Inc.) at Clearwater, South Carolina. Installed at far less cost than a unit requiring on-site erection, this Package Air Preheater will serve a \$3,000 lb/hr boiler. It measures approximately 8'x8'x6', and its 4900 sq ft of effective heating surface will recover 290°F from the stack gas.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y. Phone: MUrray Hill 2-8250

Facts and Trends — Continued from Page 4

cided that rather than make a second printing of its 1959 book, it would bring out an updated version for 1960.

The new catalog is 64 pages long, and contains the best information available on plastics in sheet, rod, tube and film forms, and the material is organized to highlight "most needed" data with quick convenience. New products like DuPont's Delrin, Fluorglas, and the copper-clad laminates, are treated in helpful detail.

GUIDE TO SILICONES - An-up-to-the-minute summary of the forms, properties and applications of Dow Corning Silicones is contained in a new free, 16-page brochure.

Silicone products reviewed range from adhesives to release agents, laminating resins to rubber compounds, and electrical insulation to water repellents. The table of contents is arranged according to applications enabling quick, easy reference to silicone materials that resist the effects of time, heat, moisture, weathering, oxidation, and chemical attack.

◆ THERMOELECTRIC - A compact, one-cubic-foot, thermoelectric refrigerator, designed and built by the Westinghouse new products laboratories, was one of the key components of a manned capsule that housed an Air Force scientist on a simulated week-long mission into space.

Thermoelectric refrigeration is achieved simply by passing an electric current through the proper kinds of semiconductor materials, and requires no compressor, refrigerant, or apparatus with moving parts. To achieve warming instead of cooling, it is only necessary to reverse the flow of electric current by flipping a switch.

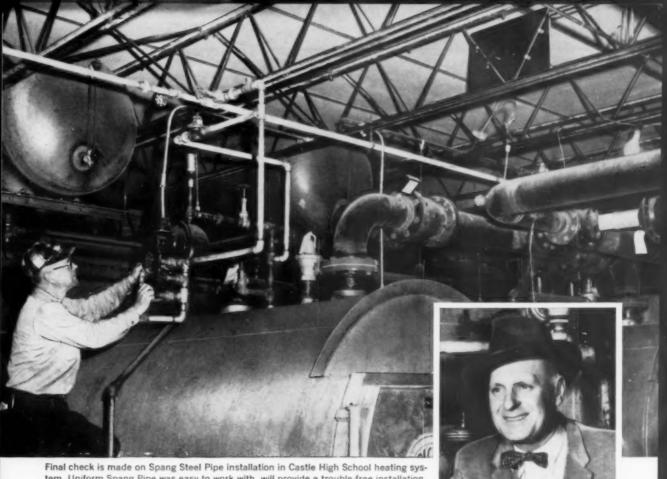
◆ TRUE WELDING CURRENT — A new product for measuring a-c welding current at the welding tip with material in the welder is now available. The unit is completely portable, features ranges of 0-10,000 amperes and 0-25,000 amperes.

The unit utilizes a toroid coil that slips around the body of the upper electrode on spot and projection welders to pick up the a-c field. The instrument features polarity reversal so that current in each phase of a complete cycle can be checked to determine performance of the ignitron tubes. Literature is available from Lebow Associates, 14857 W. 11 Mile Road, Oak Park 37, Mich.

◆ TVA FERTILIZER - As part of a proposed \$30 million cut in the President's Budget for Public Works, the Chamber of Commerce of the United States called for an end to the Tennessee Valley Authority's fertilizer business.

TVA asked for \$3,399,000 Public Works money to bolster its fertilizer venture. The National Chamber termed it "an unwarranted commercial enterprise." Complete halts in Public Works money were urged by the National Chamber for the Southwestern Power Administration, the Southeastern Power Administration, the new TVA Melton Hill dam and reservoir, and the new transmission system for the Bonneville Power Administration. Private Industry can do the jobs for which these funds were sought without cost to the federal government, the National Chamber said.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY. 806 Peachtree St., N.E. Atlanta 8, Ga.



tem. Uniform Spang Pipe was easy to work with, will provide a trouble-free installation.

"SPANG" is tops...they don't make any better steel pipe than that!"

says Mr. Jack C. Gottman, Jack C. Gottman & Co., Evansville, Indiana

"We always use 'good' pipe in our installations, and usually it's Spang," reports Mr. Gottman. "That's why we used Spang Steel Pipe in the heating system at Castle High School, Paradise, Indiana.

"Spang Steel Pipe is uniformly straight and true. It has a good galvanized finish that doesn't chip or peel in bending, and it threads nicely. It makes a good appearance in exposed locations, too. We expect Spang will give good service at Castle High for the lifetime of the school."

Quality control makes Spang tops in performance, dependability

Close manufacturing control from skelp through inspection builds into Spang Steel Pipe all those qualities you want on any job: uniformity of diameter, wall thickness and threads; straightness, clean interior, good finish, easy workability-and most of all -durability for long service life.

See your local Spang Distributor for good service on your next order. Remember: make it steel pipe . . . make it Spang Steel Pipe . . . made in USA.

Architect: Lester W. Routt & Associates, Vincennes, Ind. General Contractor: Peyronnin Construction

Company, Evansville, Ind

Mechanical Contractor: Jack C. Gottman & Co., Evansville, Ind.
Spang Distributor: Plumbing & Industrial

Supply Co., Inc., Evansville, Ind.



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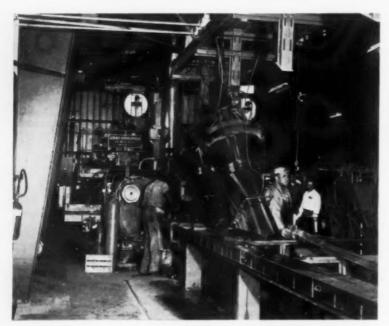
Subsidiary of Armco Steel Corporation





the SOUTH—SOUTHWEST

more power . . . more plants . . . more money



This 1500-ton extrusion press at the V. E. Anderson Mfg. Co,'s new Georgia plant turns out extrusions from pre-heated aluminum billets to supply other Anderson plants in Owensboro, Ky., and Bradenton, Fla., as well as the Rome plant.

V. E. Anderson Plant Opens at Rome, Ga.

The V. E. Anderson Mfg. Co. has opened a new 52,000 sq ft aluminum extrusion and window and door assembly plant at Rome, Georgia. Built at a cost of more than \$500,000, the plant is located on a 30-acre tract and provides for future expansion.

In addition to a 1500-ton Loewy extrusion press which "squirts" aluminum through dies to form window and door parts, and a 50-foot long Lanly heat treating oven, a 120-foot assembly line assembling two types of jalousie windows and a similar line assembling four types of sliding doors are in operation. Necessary service and space facilities have been laid out for a second big press, according to Rome Division Manager, Richard N. Anderson. A total of six assembly lines are scheduled to be in operation by July.

Air Reduction-Ala.

Air Reduction Sales Company recently dedicated its newest liquid air separation plant at Fairfield, Ala. The multi-million dollar plant will produce over 30 tons of liquid oxygen, nitrogen and argon per day.

The Fairfield facility is one of two additional air separation plants at that site. The other, which will be completed in the fall, will supply tonage oxygen by pipeline to the Tennessee Coal & Iron Division of the United States Steel Corporation.

Expansion—Oak Ridge

A contract for the construction of a new metals and ceramics facility for the Metallurgy Division at Oak Ridge National Laboratory was awarded last week by the U. S. Atomic Energy Commission to the Henry C. Beck Company of Atlanta, Georgia. The entire project, including architect-engineer services and site preparation, is estimated to cost \$6,500,000.

Upon completion of the project, the Metallurgy Division's diversified activities will be centrally grouped. Construction is expected to require approximately eighteen months. Oak Ridge National Laboratory is operated by Union Carbide Corporation for the U. S. Atomic Energy Commission.

Greenwood Mills New Sloan Plant, S. C.

Construction is under way on Greenwood Mills' new \$6,000,000 textile plant at Ninety Six, S. C. The Sloan Plant, which will employ approximately 350 workers, will supplement existing facilities of the company at that location. General Superintendent is Mr. A. L. Strawn.

Georgia Power-Columbus

The successful bidder for a contract to build a powerhouse at Georgia Power Company's North Highlands Dam in Columbus, Ga., is the Harrison Construction Company, Inc., of Alcoa, Tennessee. The bid was approximately \$1,500,000.

Estimated total cost of the development, including the powerhouse and its generating facilities, is \$7,600,000, of which approximately \$1.800,000 will be spent this year.

The project requires wrecking and removing a 59-year-old powerhouse that now occupies the site for the new plant. Of modern, semi-outdoor design, the new plant will have the latest features in automation and remote control. Its four generating units will have a total capacity of 30,000 kilowatts, compared to only 6900 kilowatts for the present plant.

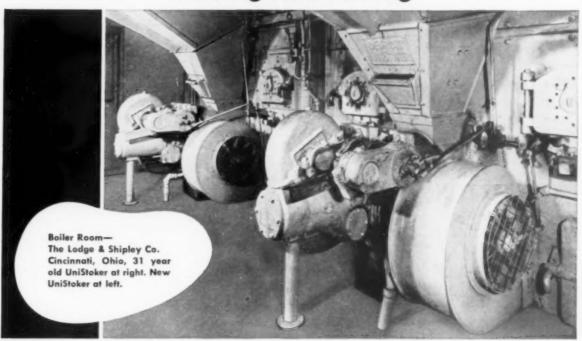
The dam itself, a 40-foot-high concrete structure that spans the Chattahoochee for a length of 728 feet, has been found to be as structurally sound as when completed in 1901.

(Continued on page 12)



THEY JUST 60 ON ... AND ON*

31 Year old Detroit UniStoker is still serving and saving



A Detroit UniStoker installed at The Lodge & Shipley Co., Cincinnati in 1927 performed so well and proved the economy of UniStoker firing so conclusively that another UniStoker was purchased in 1958 when added steam capacity was needed to serve plant expansion.

EVEN MORE SIGNIFICANT—the original UniStoker after 31 years of service was doing such a good job it was deemed worthy of modernization.

Some of the up-to-date UniStoker features were added to it and many more years of efficient operation are expected.

As the song says—"They just go on and on", saving as they go.

YOU can save with Detroit Stokers. Let one of our sales Engineers recommend the correct stoker for your needs.

The Complete Detroit Line of Underfeed and Overthrow Spreader Stokers provides a type and size for almost any boiler from 3,000 to 400,000 pounds of steam per hour capacity.

8227

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DIVISION OF UNITED INDUSTRIAL CORPORATION

MAIN OFFICE AND WORKS . MONROE, MICHIGAN

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NOW! Fuses that...

Safely interrupt fault currents up to 200,000 amperes...

Limit fault current to very low values Hold 500% load for minimum of ten seconds

Buss Low Peak fuses can completely revolutionize the protection of the entire electrical system.

Protect Mains, Feeders, Branch Circuits. Motors, Controllers, Switches—no matter whether the fault current is 1,000 amperes, 25,000, 100,000—or as high as 200,000 amperes.

Reduce stresses and prevent damage to Panel-boards, Switches, Motor Controllers other circuit components—because let-thru fault currents are limited to exceptionally low values.

Prevent work stoppages, lights out, waste of time and money—because long time-lag keeps them from opening needlessly on motor starting currents or other harmless overloads.

Permit increasing interrupting capacity and current limitation on present system at minimum cost. Before designing a new installation— or modernizing old installations—

GET ALL THE FACTS



Knowledge without action is of little value—but ACTION NOW may save you money—increase operating efficiency and reduce electrical hazards to a minimum.

BUSS LOW-PEAK fuses fit standard Switches and Panelboards and are available in N.E.C. sizes from 15 to 600 amperes in both 250 and 600 volt ranges.

Write for BUSS LOW-PEAK Bulletin Now...or use coupon.

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SHORT-CIRCUIT LIMITING ELEMENT



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Name

Title..

Company

Address.

... City

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SP(-66

News of the South-Southwest - more power . . . more plants . . . more money

PLANT PERSONNEL

Paul V. von Gonfard, formerly assistant manager of beer packaging and shipping at the main plant of Anheuser-Busch, Inc., in St. Louis, has been appointed plant manager of the Regal Brewery at Miami, Fla.

Edward L. Woolley has been named plant manager at the Fredericksburg, Va., plant of American Viscose Corporation. A. W. Hogeland. plant engineer, has also been appointed chief engineer of the Film Division.

A. E. Tull is district manager for Air Reduction Sales Company in Tampa, where Florida's first commercial liquid air separation plant is to be completed by the company in the fall.

Plant manager for V. E. Anderson Mfg. Co.'s new facility at Rome, Ga., is Martin Collins.

A. L. Strawn has been appointed general superintendent of Greenwood Mills' new Sloan Plant under construction at Ninety Six, S. C.

William R. O'Shields, senior technical service specialist for the Chemstrand Corporation, has been appointed resident technical services representative at the company's nylon plant at Greenwood, S. C., where operations are scheduled to begin in the fall of 1960.

Gasoline Plant Eunice, La.

Runnels Gas Products Corporation, wholly owned subsidiary of Union Texas Natural Gas Corporation, and Texas Gas Exploration Corporation, have awarded a joint contract to The Fluor Corporation, Ltd. to engineer, procure materials and construct additions that will double the capacity of their gasoline plant at Eunice, Louisiana.

Facilities of the plant that extract ethane and heavy hydrocarbons from natural gas by low temperature absorption will be doubled so that additional natural gas can be processed. Existing fractionation facilities will also be expanded to accommodate increased production from the extraction units. The additions are scheduled for construction completion early next year.

Nuclear Consultants

The first tenant of North Carolina's Raleigh-Durham-Chapel Hill Research Triangle has been retained as nuclear consultant for the Southeast's first nuclear power plant.

E. H. Will, chairman of the board of Virginia Electric & Power Company and president of Carolinas Virginia Nuclear Power Associates, Inc., announced that the four-company associates have signed a contract with ASTRA, Inc. of Raleigh. ASTRA will be nuclear consultants for CVNPA's nuclear plant scheduled for completion in 1962 at Parr, S. C.

FUTURE EVENTS of Engineering Interest

June 5-9: ASME Semi-Annual Meeting & Aviation Conference, Statler Hilton Hotel, Dallas, Tex. American Society of Mechanical Engineers, 29 W. 39th St., New York, 18, N. Y.

June 6-9: NDHA Annual Meeting, Grove Park Inn, Asheville, N. C. National District Heating Assn., 827 Euclid Ave., Pittsburgh 6, Pa.

Sept. 7-15: 2nd Coliseum Machinery Show, Chicago Coliseum, Chicago, Ill. A. Byron Perkins, Exec. Mgr.. 2807 Sunset Blvd., Los Angeles 26, Calif.

Sept. 18-21: ASME Petroleum Mechanical Engineering Conference, Jung Hotel, New Orleans, La. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Oct. 24-25: ASME-AIME Fuels Conference, Daniel Boone Hotel, Charleston, W. Va. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Nov. 28-Dec. 2: 24th National Exposition of Power & Mechanical Engineering: ASME Annual Meeting, Statler Hilton Hotel, New York. International Exposition Co., 480 Lexington Ave., New York 17, N. Y. E. K. Stevens, Mgr.

Feb. 13-16, 1961: 15th International Heating & Air Conditioning Exposition. International Amphitheatre, Chicago, Ill. American Society of Heating, Refrigerating & Air Conditioning Engineers, National Meeting. International Exposition Co., 480 Lexington Ave., New York 17, N. Y. E. K. Stevens, Mgr.

(Continued on page 16)



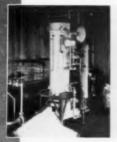
5000 PSI WITH FOUR-STAGE MIXED GAS RECIPROCATING COMPRESSORS is achieved by the two Cooper-Bessemer units shown on stream at the Fortier Plant of American Cyanamid Company, Avondale, La. Pressure goes from 60 psi to 225 psi, entering second stage, 670 psi entering third stage, 1500 psi entering fourth stage, to a maximum of 5000 psi. Comparable centrifugal compressors would require 50 to 60 stages to reach this output. The units, Cooper-Bessemer GMW gas engine compressors are used in the manufacture of 100 million lb of anhydrous ammonia annually. The higher pressure enables the manufacturer to operate the Haber Process (manufacture of ammonia from hydrogen and nitrogen) at 320 atmospheres, instead of the 200 atmospheres pressure normally used.

Voot PRODUCTS



FORGED STEEL VALVES & FITTINGS FOR TOUGHNESS AND TROUBLE-FREE SERVICE

Forged from carbon and alloy steels, Vagt valves, fittings, flanges and unions are built to safely handle liquids and gases at high pressures and temperatures in the modern petroleum refinery and petro-chemical plants. The complete line includes flanged, screwed and socket weld end globe, gate and check valves—ells, tees and crosses—couplings—bushings—plugs—unions—flanges and flange unions—and weld caps.





MORE REFRIGERATION TONNAGE AT LESS COST

More than 70 years of engineering and manufacturing experience is incorporated in Vogt refrigerating and ice making equipment. Compression Systems and Tube-Ice Machines in a wide range of capacities serve industrial and processing plants and institutions here and abroad.



SPECIAL MATERIALS COMEAT CORROSION AND PRODUCT CONTAMINATION

Our modern shops produce a wide variety of equipment from special metals and alloys to fight corrosion and product discoloration or contamination. Fabrication procedures insure that corrosion resistant properties of welds will match that of the materials used to construct the equipment.





PROCESS EQUIPMENT FOR EVERY SERVICE

Vagt constructs process equipment in wide variety to all Codes. Stills and towers, oil chillers, crystallizers, heat exchangers, molding machines, etc., serve in the manufacture of oils, greases, 100 octane gasoline, synthetic rubber, chemicals and related products around the world.



HIGH EFFICIENCY STEAM GENERATORS

Vogt steam generators are designed to give maximum rating in a minimum of space, with high efficiency and low maintenance expense. Bent tube and straight tube designs are available for solid, liquid or gaseous fuels to meet every power, process or healing requirement.



HENRY VOGT MACHINE CO., LOUISVILLE, KY.

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PRODUCTS FOR REFINERIES, CHEMICAL
PLANTS, POWER PLANTS AND PROCESS INDUSTRIES
Write for literature, Dept. 24A-GS

"Here at MINNESOTA MINING we're coating*

has branched out from its original sandpaper business into a wide variety of product lines. However, most of these product lines are direct descendants of sandpaper, 3M's original product, in the sense that *coating techniques play an important part in these products. This is true of such seemingly unrelated items as presensitized lithographic plates, pressure sensitive tapes, decorative ribbon, roofing granules and reflective sheeting.

As specialists, we liked the OTIS specialist's approach to Elevator Maintenance right from the start. We decided it was the only way to keep our 6 OTIS Passenger Elevators and 10 OTIS Freight Elevators running at their original efficiency during their entire lifetime. We've been using OTIS Elevator Maintenance since 1933.

What is the OTIS specialist's approach to elevator maintenance? It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at the right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

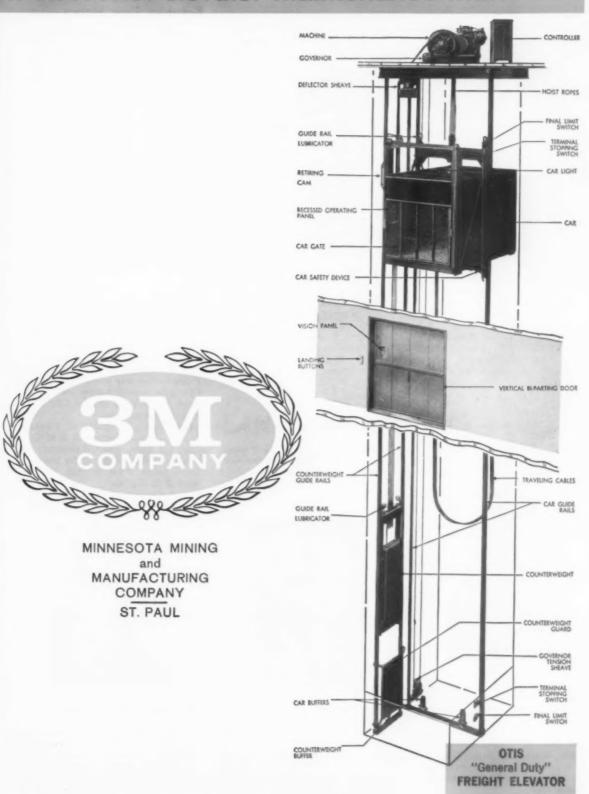
METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdowns to an absolute minimum and assure the highest possible safety.

freight elevator maintenance

THAT KEEPS ELEVATORS RUNNING LIKE NEW

OTIS ELEVATOR COMPANY . 260 ELEVENTH AVENUE . NEW YORK I, N.Y. OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

men...not elevator maintenance men"



News of the South-Southwest — more power . . . more plants . . . more money



Reynolds Aluminum Supply Company—Jacksonville

Reynolds Aluminum Supply Company, 46 year old distributor of metals and building materials in the South, has announced that a new 38,000 sq ft aluminum-clad plant is being built in Jacksonville, Florida.

Paul H. Fox, president of the Atlanta based firm, said the new building would house more than a quarter of a million dollars worth of industrial metals and building products.

Mr. Fox emphasizes that aluminum is not the company's only stock in trade. The Jacksonville branch will handle a complete line of aluminum, steel, brass and copper industrial metals as well as all types of building materials. The new distribution center in Jacksonville will give faster service to customers in north Florida and south Georgia.

The new center will be staffed with the Company sales group already active in Jacksonville. Stanford Davidson will continue as Branch Manager.

Originally known as Southern States Iron Roofing Company, Reynolds Aluminum Supply Company is affiliated with Reynolds Metals Company.

Edward Valves - S. E.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Indiana, has



named Warren R. Kenefick sales engineer for its line of high-pressure, high-temperature forged and cast steel valves in the Southeast District.

Mr. Kenefick will cover the sixstate area of Georgia, Alabama, Florida, North and South Carolina, and most of Tennessee from the district office at 1495 Northside Dr., Atlanta, Ga.

Cooper-Bessemer - Okla.

Dressler M. Pruett has been transferred to The Cooper-Bessemer Corporation's Tulsa, Oklahoma district office, 201 E. First Street, as a sales engineer.



Prior to his association with Cooper-Bessemer in 1957, Mr. Pruett was with E. I. du Pont de Nemours & Co., Savannah River plant. He is a graduate of Oklahoma State University and is a member of the American Institute of Industrial Engineers.

Republic Flow Meters-Lg.

Republic Flow Meters Company, a subsidiary of Rockwell Manufacturing Company, has moved its New Orleans office to 5534 Canal Blvd. (P. O. Box 12044, New Orleans 24). The office is managed by George Reech. Cecil Lyle is service engineer.

Guth-St. Louis

Roger E. Bessmer has been appointed by the Edwin F. Guth Company, St. Louis, Missouri as their new lighting representative for Western Missouri and Northern Kansas.

Mr. Bessmer has over five years experience as a lighting manufacturer's representative.

Byron Jackson - N. C.

J. Don Lee has been appointed district manager of the new Charlotte, N. C., office of Byron Jackson Pumps, Inc., at 205 S. Church St. The company's Greenville, S. C., district office was recently moved to Charlotte to permit more centralized sales and service to the Carolinas and Tennessee.

Mr. Lee, a graduate of Furman University and Clemson A & M College, has been with the company as industrial sales engineer for the past three years. Prior to that, he was with J. E. Sirrine.



Midwest Piping-Mo.

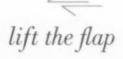
Warren Smith has been appointed Assistant Director of Manufacturing Sales for welding fittings and flanges of Midwest Piping Company. Inc.. St. Louis. He will work with field representatives from coast to coast.



improvements can benefit your plant operations . . .

TService-mark of American Radiator & Standard Sanitary Corporation

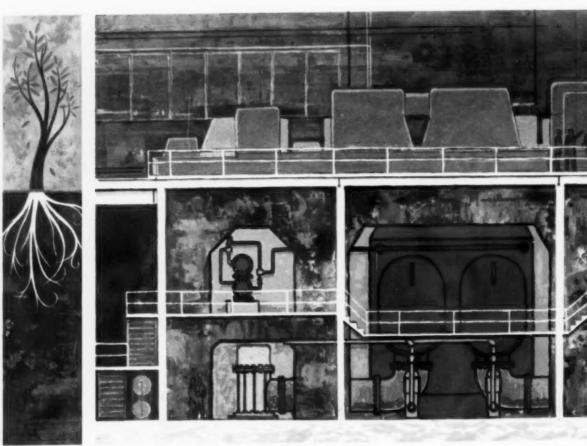
development, research, and field experience over more than four decades. To see how their design



surface cor

WITH TOMORROW'S DESIGN IMPROVEMENTS TODAY

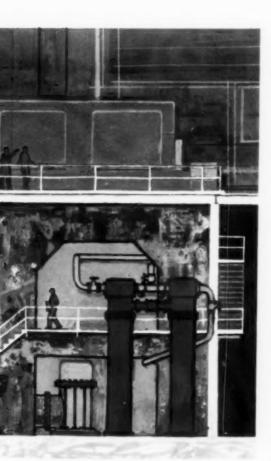
For the plant in your future you can plan with confidence using American-Standard surface condensers of today. They've made remarkable records of long, trouble-free life in producing design vacuum, zero degree depression hotwell temperature, and complete deaeration over a range of operating conditions—a result of many design improvements



Copyright 1960, American Radiator & Standard Sanitary Corporation

ndensers

and engineering features: Short steam path through tube bundle and improved steam distribution reduce pressure drop and assure top condensing efficiency of all tube surface. Pressurizing steam scoop traps inlet steam for deaerating hotwell. Hotwell deaerating trays further scrub condensate, completing deaeration and producing hotter feedwater. And new advance-design features reduce erection cost up to 65% over conventional methods.

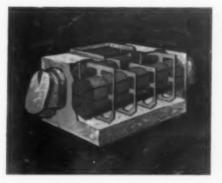




Moisture impingement grids extend tube life, and assure even distribution of steam.



Condensate removal trays' unique location gives effective deaeration, higher vacuum.



Extremely low bundle entrance velocity, exceptionally large steam transportation lanes.



American-Standard feedwater heater has a closure designed for ease of assembly and disassembly—which won't leak, even against highest operating pressures. It's simple, with only four major parts: pass partition plate, closure, seal, weld or compression ring. Rugged...design stresses are much lower than required by ASME Code. Compact, with a diameter smaller than similar units.

As near as your phone . . . American-Standard Industrial Division Power-Lift Products and Services. Talk over your requirements with an American-Standard* Industrial Division product specialist. You'll find him well prepared and experienced - frequently able to base equipment recommendations upon precedents of proved success. And, in many instances, our comprehensive standardization paves the way to savings in time and cost. Offices in all principal cities. American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited. Toronto. Ontario. Export Division, American-Standard, New York City.



AMERICAN BLOWER PRODUCTS . ROSS PRODUCTS . KEWANEE PRODUCTS

Designed to service the largest of today's and Surface tomorrow's steam turbines. Low bundle condensers entrance velocity; liberal steam transportation lanes; moisture impingement grids to extend tube life; expansion diaphragms; effective deaeration and many other features created during 40 years of surface condenser development and research.

Mechanical draft, induced draft, gas recirculating, and draft fans primary air fan applications. Designed to meet rigid requirements of modern power plants where maximum pounds of steam are produced daily at peak efficiency. Airfoil, forward curved, backwardly inclined, radial, radial tip blades.

Design incorporates unique new High Pres-Feedwater sure Closure. Maintenance is simplified with heaters only four major parts. Exceptionally high safety factor built into all units-more than double ASME Code requirements. Temperature stresses from start-ups or load changes virtually non-existent.

Heat Designed and built with thoroughness and precision. Standard or specially engineered exchangers units for virtually all conditions and applications, including high pressure-high temperature exchangers, compressor inter- and aftercoolers, fuel oil heaters, blow-down exchangers, and many others.

Provides stepless adjustable speed control for Gyrola fans and boiler feed pumps. Performance, fluid drive power savings, and reliability proved in the field. Units for motor driven boiler feed pumps or for "on-the-shaft" duty on main turbine generator. Drives are available for fan and pump duties for all boiler sizes.

Fly ash and "cyclone-type" collector. Series 342 Dust dust collectors Collector: uses "cyclone" principle, with individual tubes which permit flexibility in design to fit plant layout. Series 361 Dust Collector: combines primary and secondary systems for high efficiency fly ash recovery.

^{*}American Standard and Standard are trademarks of American Radiator & Standard Sanitary Corporation



News of the South-Southwest - more power . . . more plants . . . more money

Allis-Chalmers-Mo.

J. A. Sudduth has been appointed manager of the St. Louis district by the Industries Group of Allis-Chalmers. He succeeds R. E. Morris, who was named Midwest regional manager.

A mechanical engineering graduate of Purdue University, Mr. Sudduth joined Allis-Chalmers in 1948.

Brown Fintube - Okla.

The appointment of Lloyd A. Alaback and his newly formed Thermal Engineering Company, as sales representatives for the Brown Fintube Company was announced recently.



Mr. Alaback will handle the sale of Brown Fintube heat transfer equipment consisting of double-pipe finned heat exchangers, tank heaters, tank suction and line heaters, indirect fired heaters, and other heating and cooling equipment. His territory will include Oklahoma, Kansas, Nebraska and Western Missouri, with headquarters at 1574 East 21st Street, Tulsa 14, Oklahoma.

Mr. Alaback attended Oklahoma A&M College, where he received a B.S. degree in Industrial Engineering. He is a registered professional engineer and has considerable heat transfer experience.

American Water Softener Co. — Mobile, Ala.

American Water Softener Co., Inc., of Philadelphia, Pa., announces the appointment of Industrial Power Equipment Company, of Mobile, Alabama, as representatives for American water conditioning equipment and engineering in the states of Alabama, Mississippi, Louisiana and a part of the states of Arkansas and Florida.



James T. Prince



Sam R. Steele

Oakite-Fla., Ala.

James T. Prince and Sam R. Steele have been appointed technical service representatives in Tampa and Birmingham by Oakite Products. Inc., manufacturers of specialized chemical compounds for industrial cleaning, sanitizing, metalworking and surface treatments.

Both men completed an intensive eight-week training program at the company's laboratories and in the field before undertaking their new assignments. The Tampa territory was recently established. In Birmingham Mr. Steele joins F. W. Weldon, a veteran representative.

Reynolds Aluminum Birmingham, Ala.

Reynolds Aluminum Supply Company has announced the promotion of Walter Rivers to the position of Assistant General Manager in Charge of Sales for the drum division, Southern States Containers, Birmingham, Ala. Mr. Rivers has been General Manager of Sales for Southern States since 1955.

Southern States Containers produces light and heavy gauge drums for the paint, chemical and naval stores industries. The company's plant in Birmingham is highly automated and is equipped to produce a complete range of metal drums for any purpose.

Cooper-Bessemer — Dallas

David James has been named a sales engineer with the Dallas office of The Cooper-Bessemer Corporation.



Mr. James was previously assigned to the Mount Vernon headquarters office. Before joining the company he was associated with Ethyl Corporation, and The Texas Company. He is an industrial engineering graduate of Oklahoma State University.



Kennedy Valve Carolina Representative

William F. Kegley, Jr., has been named sales representative of **Kennedy Valve Mfg. Co.** covering North and South Carolina. He will be located at 5341 Valley Forge Road, Charlotte, North Carolina.

Mr. Kegley is under the direct supervision of Avary Austin, Kennedy sales representative at the Atlantic office and warehouse.

News of the South-Southwest — more power . . . more plants . . . more money

Cooper-Bessemer - La.

Owen T. Tolson has been named a sales engineer with the Shreveport, Louisiana office of The Cooper-Bessemer Corporation, Mount Vernon, Ohio.



Mr. Tolson was earlier associated with Cooper-Bessemer as a sales engineer in the home office. More recently, he has been with the Foxboro Company in Shreveport. Mr. Tolson is a mechanical engineering graduate of Southern Methodist University, and is a member of the American Society of Mechanical Engineers.

Century Electric-Southeast

The Century Electric Company, St. Louis, Missouri, manufacturers of motors and generators, have announced reorganization of their national sales force into six major Divisions.



James S. Smith, previously manager of the Century Baltimore Branch Office, has been appointed Southeast Division Sales Manager. Mr. Smith, who will have his head-quarters in Baltimore, will be responsible for the areas covered by the Atlanta, Baltimore, Birmingham, Jacksonville and Richmond Offices.



Cornell-Dubilier-SE

John H. Feder, Jr., has been appointed District Manager of the Cornell-Dubilier Electric Corporation, to direct sales activities in the territory which includes Delaware, Washington, D. C., Maryland and Virginia. He will continue to make his headquarters in York, Pa.



General Electric-La.

Martin J. Lewis, formerly Field Sales Representative for General Electric Central Air Conditioners in the South-Central Texas area, has been appointed Manager of Central Air Conditioning Sales for G-E's Sales and Distribution Department, New Orleans District.

Mr. Lewis has been with General Electric since 1953. His new offices are at 4221 Bienville Street, New Orleans, Louisiana.

Union Carbide - Dallas

Robert Halvorsen has been appointed as a Technical Sales Representative in the Mid-Western Region of Union Carbide Plastics Company. Division of Union Carbide Corporation. Mr. Halvorsen will

handle the sale of Bakelite Brand epoxy, polyethylene, phenolic, styrene, and vinyl resins and compounds. He will be located at 6300 North Central Expressway, Dallas 6. Texas.

Mr. Halvorsen was graduated from Tufts University in 1957 with a Bachelor of Science degree in Chemistry. He joined Union Carbide later that year.



Midwest Piping Tulsa Sales Office

Midwest Piping Company, Inc., St. Louis, has announced the opening of a sales office in Tulsa for an area comprising Oklahoma, Arkansas and northwest and west Texas. Earl B. Marrs has been appointed manager of the new office. The address is Suite 1016, 9 East 4th St., Tulsa 3. Okla.

Cleaver-Brooks Sales Agents

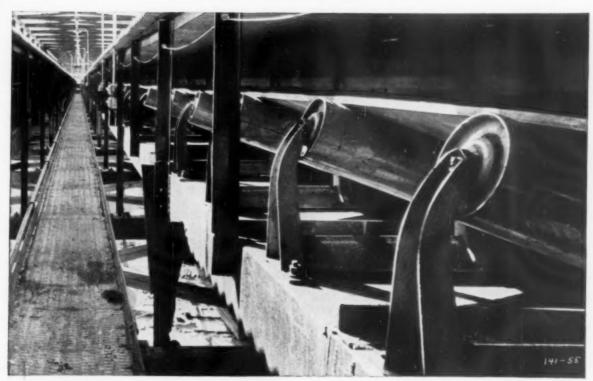
Three new sales agents were named recently by Cleaver-Brooks Company, Milwaukee, to handle the sale of packaged fire-tube boilers.

The agents include Joe Trabue Company, St. Louis, Missouri; Tate Engineering, Inc., Baltimore, Maryland; and Dixie Boiler & Equipment Company, Nashville, Tennessee.

Automatic Control Co. Texas and Kentucky

Among several newly appointed sales representatives for the Automatic Control Company of St. Paul, Minn., are Livingston Machinery Sales, Inc., in the Dallas, Texas area; and Henry P. Thompson Company for the Louisville, Kentucky and Cincinnati area.

(Continued on page 87)



Automate your materials handling ...

with Jeffrey equipment

Efficient, dependable Jeffrey conveying equipment is a valuable antidote for rising costs in processes where bulk materials must be moved. Permaseal* idlers on these conveyors mean years of usage without greasing—contribute to lower operating and maintenance costs.

Jeffrey products are available through distributors in principal cities. You'll find these men *production-conscious*, ready and willing to advise on your conveying needs. For this help, see them or write The Jeffrey Manufacturing Company, 898 North Fourth Street, Columbus 16, Ohio.



Jeffrey spiral conveyors are available in many styles for moving dry, bulk materials. Compact, they occupy minimum space. Convenient, they can be fed or discharged at any point along their length.



Components of Jeffrey bucket elevators and other conveyors can be constructed to withstand corrosive attack, assuring long life and safeguarding materials handled.



For in-plant conveying or for belts extending across country. Jeffrey PERMANEAL® idlers offer every feature essential to belt protection, dependability and long service.

CONVEYING · PROCESSING · MINING EQUIPMENT...TRANS-MISSION MACHINERY...CONTRACT MANUFACTURING





INDUSTRY SPEAKS

Competition in a World Economy

Industry in the United States must eliminate negative thinking and take positive steps to become more competitive in domestic world markets, Edw. A. O'Neal, Jr., President of the Chemstrand Corporation, said in a recent address before the Charlotte Textile Club.

MR. O'NEAL urged representatives of the textile industry to place greater emphasis on research and development, to take positive steps to bring about a change in the political philosophy and attitude of our governmental leadership, and to develop better market planning — programs that are long-range, yet flexible.

Noting that Americans may be "emphasizing the negative," the Chemstrand President suggested a positive approach be adopted. Until the standard of living in other nations more nearly approaches that of the United States some program of selected tariffs will be necessary. "Let us not depend wholly upon government to solve our problems. The tariff question is not one to be approached hastily and with the thought only of today, tomorrow or the next day. It is worthy of deep, thoughtful consideration."

Commenting on the general economy, Mr. O'Neal asserted that in developing the standard of living of the United States and in assisting in building the economies of our friends and allies, we have allowed an "inflationary trend to build into our economy, thus adversely affecting the value of our currency."

"We have traded away through our policy of free trade too many of the checks and balances our fathers built into our democratic system.

"Under the guise of the Foreign Trade Agreements Act of 1934, as amended and extended to June, 1962, we have destroyed and will continue to destroy the balances required to maintain our high standards by negotiations at the international level through the general agreement on tariffs and trade.

"In accepting the results of these negotiations to lower our tariffs, we have accepted so-called reciprocal tariff reductions abroad, while ignoring other more potent restrictive practices such as currency control, import licenses, and subsidized exports.

"There are laws on our books which, if administered more in our interest, would clear up this peril. We have a great leadership in our government, our president and his staff, our senators and representatives. Our job is to tell them what we want and in no uncertain terms. We elect our senators and representatives. We also have the responsibility of keeping them informed of our requirements, national and local, and to insure by all means available to us their actions on our behalf. May I suggest we reassume our responsibilities."

Mr. O'Neal asserted there are steps which the industry, itself, can take to better its competitive position.

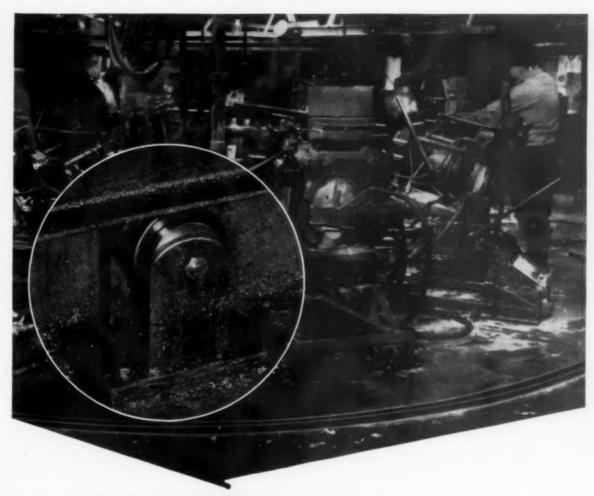
"We are constantly improving our efficiencies, our processes, our machines and methods of operation to produce better goods at lower cost. We continuously study our markets and devise new and better methods of distribution.

"Nevertheless, these efforts must be stepped up if we are to stay ahead of competition. We should not be afraid to explore new techniques and procedures utilizing the fine tools which science and technology have given and are giving us.

"We should throw greater emphasis into research, both in expenditure and effort. Our mills and factories will continue to sell those things unique in design and performance.

"Our marketing programs must be the result of long-range planning, yet with a high degree of flexibility built in. Instead of sitting in paralyzed panic, waiting for the coup-de-grace from low priced imports, we should explore the foreign field to see what we can sell them. This will require that we make an effort to determine what other countries want.

"We must make our great advantages count for the maximum — our well organized programs of research and development, our production know-how, and our marketing skills. Let's accentuate the positive."



Dixie Bearings turned this turntable from a costly maintenance problem into a smooth, trouble-free operation!

Our customer, an aluminum foundry, designed and built this system for continuous and automatic pouring of permanent mold castings. The turntable is approximately 20 feet in diameter. Supporting the table, which weighs several tons, were 20 large, double-row bearings. The life of these bearings was only a few weeks and their cost, plus downtime, was becoming increasingly expensive.

Our bearing engineers were asked for a solution and, after an investigation, recommended a camroll bearing.

Now, after many months of operation, all turntables in the plant are equipped with the bearings we recommended and there has not been a bearing failure in that period!

If you have a problem involving bearings, call the Dixie Bearings branch nearest you for expert help. We are the authorized distributor for all the bearings we sell—your guarantee that the bearings we deliver will be of the latest manufacture and right for your application!

Providing bearing service in the South>

DIXIE BEARINGS, INC.

FLORIDA: Jacksonville • GEORGIA: Atlanta • KENTUCKY: Louisville
LOUISIANA: Baton Rouge • New Orleans • N. CAROLINA: Charlotte • Greensboro
S. CAROLINA: Greenville • TENNESSEE: Chattanooga • Kingsport • Knoxville • Nashville
VIRGINIA: Norfolk • Richmond

MANAGEMENT CLINIC

Conducted by ROBERT H. EMERICK, North Charleston, S. C.



Pinching Pennies Breeds Hoarding

Question

DURING THE PAST YEAR, we have experienced a number of production interruptions as the result of parts and materials failing during operations.

Our plant people blame these troubles on a top management policy of austerity buying. This policy was initiated more than a year ago, and forbids the stocking of most spare parts and replacement materials. It is based on the availability of many items locally, but since these cannot be purchased until an actual failure occurs, preventive maintenance inspections are being made haphazardly or not at all. There is an attitude that inspections are a waste of time, as nothing can be done anyway.

We realize that this attitude is an unhealthy one, but the reason for the austerity program lies in the hoarding habits of the very shop people who criticize it. It came about after an inventory run-down discovered numerous spare parts and materials snugged down in lockers, work bench drawers and cabinets, some of these items being for machines we no longer have.

The question is, how can we obtain effective preventive maintenance, and simultaneously support the austerity policy?

Suggestions

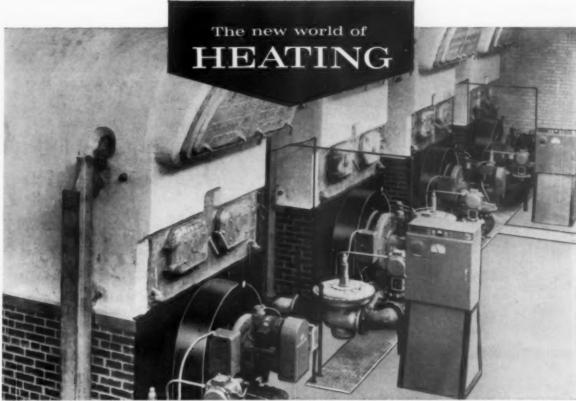
PREVENTIVE maintenance and austerity are compatible, provided austerity is recognized as meaning unadorned, unembellished and severely simple, but not meaning starvation.

The first step in this case is to revitalize the inspection program, by insisting on the submission of a report for each condition found. Second, the maintenance superintendent, production manager, or other competent individual must be authorized to sign purchase orders on the basis of the inspection reports, rather than to wait for the breakdown. Any other policy makes production stoppages as unavoidable as tomorrow, and is austerity carried to the point of starvation.

An austerity program that works is practiced in many companies by simply setting a dollar limit on the funds that may be devoted to maintenance during a designated period, say six months or a year. Then the maintenance and production people together decide on how many of these dollars can be earmarked for routine jobs such as the replacement of pump packing, line gaskets, bearings, welding and so on, and it's up to them to live under this ceiling. Unforeseen casualties are prepared for by keeping a portion of the funds liquid. This plan is helped by purchasing from local stocks, thereby avoiding tying up funds in inventories.

Under this program, funds are not carried over. What isn't used from the appropriation during the designated period is withdrawn and a new budget is set for the next period. It all adds up to a tough policy to live under, but it's efficient and it works.

Spare parts hoarding is always a temptation when funds face withdrawal at the end of the period as outlined above. To avoid it, many managements set up checking teams that peer into every locker, drawer and cabinet at irregular intervals and without prior warning to the owners of such hiding places. Items found are returned to stock, and employees involved, including their supervisors, are disciplined. This also works.



This Kansas high school heating plant uses four Iron Fireman dual-fuel burners with factory built control panels.

Add high efficiency firing without boiler alteration

Factory engineering replaces local "cut and try" firebox design

The Iron Fireman AirRing* dual-fuel burner (shown in the high school heating plant above) is a complete factory built package that is simply bolted to the boiler front.

The package includes both primary and secondary air systems, combustion safety controls, ignition and fuel systems for either one or two fuels, and factory engineered refractory combustion throat.

This compact unit not only reduces on-the-site construction, but achieves superior performance by supplementing local craftsmanship with experienced application engineering. Complete combustion is accomplished without flooding the firebox with excess air.



This cutaway shows how oil, gas and air are introduced into the combustion clamber through a single firing port. No checkered floor, firing arch or boiler pit. Flame is generated within a cone of air—no inefficient infusion of underfloor air.

*Trade-Mark

Mail coupon for full information and specifications.



IRON FIREMAN

HEATING AND AIR CONDITIONING

AIRCRAFT COMPONENTS AND EQUIPMENT

MISSILE AND AIRPLANE GYROSCOPES

ELECTRONIC EQUIPMENT

CONTROL INSTRUMENTS

Iron Fireman Mfg, Co., 3061 W. 106th St., Cleveland 11, Ohio (In Canada, 80 Ward St., Toronto)

Please send complete technical description and specifications on Iron Fireman AirRing firing.

Name

Firm

State or Prov.

Address

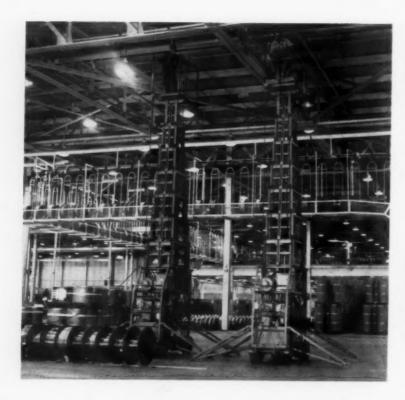


Fig. 1—Telescoping Hydraulic Platform Lifts can be powered from 115 volt convenience outlet on 480 volt bus duct. Notice the 3 kva dry type transformer mounted on the units.

By
W. S. ELLIS
Electrical Maintenance Foreman
K. B. STEWART
Manufacturing Engineer
G. E. CHAPMAN
General Foreman, Maintenance
Westinghouse Electric
Corporation, Athens, Ga.

Georgia plant electrical service designed to avoid production outages

A Well Planned Electrical Distribution System

A HIGHLY AUTOMATED manu-

facturing plant such as the Athens Westinghouse distribution transformer plant must be designed to minimize possibilities for production delays. The most logical place to start to insure production is with the electrical distribution system which is the heart of modern industrial plants. The distribution system must be planned to provide the quality of service that loads require. The following is a description of what was done at the Athens plant to insure production.

Power is supplied to the Athens Westinghouse distribution transformer plant from two separate utility circuits at 44 kv. If a power failure is experienced on one of these circuits, the automatic throwover equipment located in our plant's outdoor substation will

automatically switch to the other circuit (Fig. 3).

The plant's outdoor substation is equipped with two 3750-kva, 44 kv/4.16-kv transformers which are normally operated in parallel, although each is capable of carrying the entire plant load.

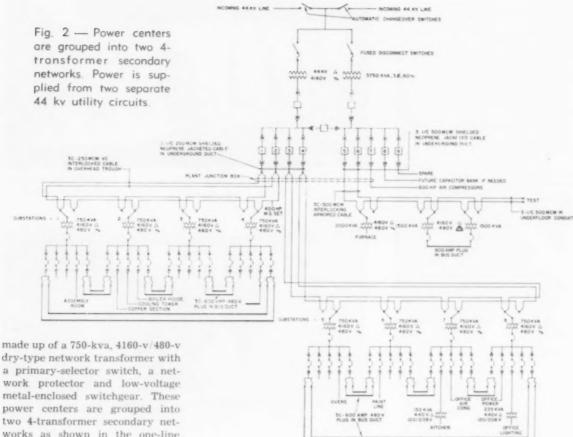
The outdoor metal-clad switchgear contains a circuit breaker in the secondary of each transformer, a bus-tie circuit breaker, nine feeder circuit breakers, and the necessary metering equipment (Figures 4 and 7).

The 4160-volt feeders are three single-conductor, shielded, neoprene-jacketed cables in an underground duct from the outdoor substation to a junction box within the plant. From this junction, three-conductor VC interlocked armor cable, run in overhead troughs, is used to supply power to

one 400-hp motor, eight 750-kva, two 1500-kva, and one 2000-kva ASL indoor Power Centers throughout the plant. One 4160-volt feeder is connected directly to the power house in the same type underground duct to supply power for two 300-hp synchronous motors for driving air compressors.

Indoor Power Centers are located on top of the plant restrooms to minimize the possibility of untrained employees tampering with them, to minimize the amount of dust being circulated through the equipment, minimize the possibility of the Power Center being flooded due to breakage of a water or sprinkler line, to minimize the possibility of damage from the operation of fork trucks and cranes, and to increase the availability of floor space for manufacturing.

Each of these Power Centers is



work protector and low-voltage metal-enclosed switchgear. These power centers are grouped into two 4-transformer secondary networks as shown in the one-line diagram (Fig. 2).

The 480-volt secondary circuits

Fig. 3-Main plant substation has two 3750 kva, 4.16 kv transformers, metal clad switchgear, and automatic equipment to switch from one utility feeder to the other.

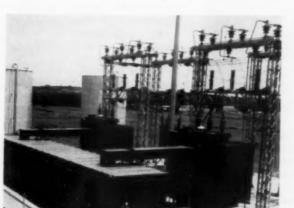


Fig. 4-Metering equipment is housed in outdoor metal clad switchgear.



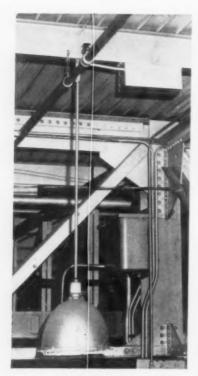


Fig. 5—30 kva dry type transformer fed by 480 volt bus duct supplies 120/208 volt power for lighting and small loads.

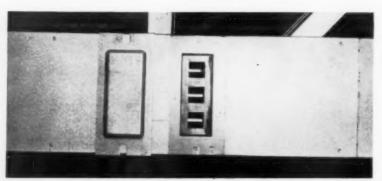
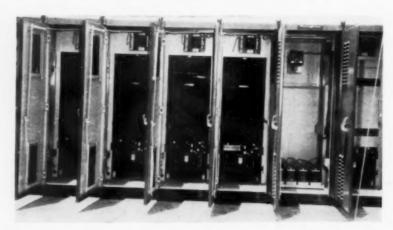


Fig. 6—480 volt 3 phase plug-in bus duct simplifies new installations and rearrangements.



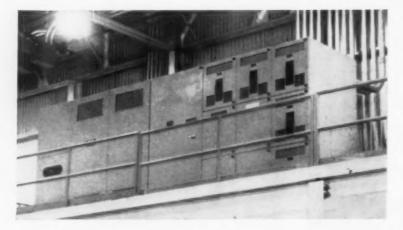


Fig. 7 Above—Outdoor metal clad switchgear gives protection from weather. Inspection and maintenance is simplified by accessibility.

Fig. 8 Left—Plant substations are located on top of restrooms to save floor space and protect equipment.

of the network utilize 600-ampere, 3-conductor, plug-in bus duct. These overhead bus duct runs are located at every other column line throughout the plant. This limits the distance of electrical cable runs for production equipment to a maximum of 80 feet.

Feeders for individual loads requiring less than 100 hp are conveniently connected to the bus duct by means of a plug-in type circuit breaker (Figures 1 and 6).

In fact, the plug-in breaker is so convenient that we utilize it in our mobile hydraulic work platform lifts. These work platform lifts are mounted on industrial trailers and are capable of lifting a 1,000 pound weight 35 feet into

In most cases the 11/2-hp 120-v

motors on these lifts are operated from 20-ampere 120-volt convenience outlets which are located on every other column in the plant. But in cases where the load being lifted is nearly 1,000 pounds, the maintenance employee will plug the lift into the nearest convenience outlet and lift himself to the nearest 480-volt bus duct. He will install a plug-in breaker in that bus duct and operate the lift on 480 volts through a dry-type transformer located on that lift. This eliminates stoppages caused by the

convenience outlet breakers kicking out due to overload when the lift is being operated at its maximum capacity.

Power for lighting, convenience outlets, and 120-volt power is obtained from 30-kva dry-type transformers mounted on factory columns as shown in Figure 5. The primary of these transformers is fed from the adjacent 480-volt bus duct.

Mercury-vapor fixtures are utilized in high bay areas and fluorescent fixtures are used in low ceiling areas such as offices, laboratories, restrooms, and assembly rooms. The illumination level is

kept at 50 foot-candles in the general plant area with more as required by particular production operations. A 225-kva dry transformer supplies all lighting, business machines, etc., in the office building. The cafeteria, however, has a separate 150-kva dry-type transformer.

All wiring in the plant is in rigid conduit either dropped directly down to the equipment from the roof trusses or run down a column and buried in the concrete floor to the equipment site. The method depends on whether or not there are bridge cranes in the particular area. Wiring in the

office building is in rigid conduit in an underfloor duct system.

Provisions have been made for the addition of a bank of shunt capacitors for power factor correction should this become necessary. The combination of highly efficient equipment and two 300-hp synchronous motors have kept the power factor between 98.8 and 99.4 per cent to date.

Our experience with this plant's electrical distribution system substantiates our planned expectations. No production downtime has been experienced because of any weaknesses in our power distribution system.

Infra-Red Heat for Mechanics

IN A CONSTRUCTION equipment

maintenance shop heating is always a difficult problem. This is especially true where a great amount of movement of large equipment is involved. In most cases the doors have to be opened to their full capacity. These doors, of course, are usually the height of the walls and will admit vast quantities of cold air. This cold air replaces the warm air in the shop very quickly and conventional warm air heaters are very slow in overcoming the cold.

When M. T. Reed Construction Company of Jackson, Mississippi, built a new maintenance shop, comfortable working conditions were a prime factor. The tractors, bulldozers and other heavy equipment which they service and maintain are a cold mass of steel in the winter. This means that a mechanic had to work on cold steel with cold tools on a cold floor.

Panelblock overhead infra-red gas-fired radiant heaters were recommended by Palmer Air Conditioning & Heating Company, who as heating consultants were called in on the job. The building is constructed of concrete blocks with a pre-stressed concrete roof. It is 38' x 60' with three stalls or working areas for the mechanics. The doors are corrugated iron on rollers with clear plastic membrane for windows in the top section of the doors. Two Panelblock

heaters were used on this installation. The units are designed to focus infra-red heat rays in a concentrated area, thereby radiating the heat in a relatively small working area. The floors absorb the heat as well as the hand tools which are under the "canopy" of heat and are, therefore, comfortable from the standpoint of the mechanics. The floor being warmed first keeps the mechanics' feet warm while at the same time they receive infra-red heat themselves. Very shortly after a truck or piece of equipment is driven in under the heaters, it in turn is warmed by the gentle infra-red radiation from the Panelblock heaters, making it comfortable to work on.

There is negligible loss of heat when the doors are opened because objects are being warmed by the infra-red radiation rather than heating the air which is lost every time the doors are opened. With infra-red radiant heat you can feel the cold draft the moment a door is opened, but as soon as the door is closed you immediately feel the warmth just as you feel the sun's rays when you walk out of shade into the direct sunlight.

In rainy weather any water on the equipment just brought inside is very rapidly evaporated — both from the equipment and drippage on the floor due to the infra-red radiation.

In this particular shop when re-



painting equipment, the equipment can be driven under the heaters, repainted, the heaters turned on and left there to cure and dry by infra-red radiation.

Since Panelblocs were installed in a new building the comparison of cost of operation against other types of heat has not been determined. But with this type of operation forced air heat or heat from suspended unit blower heaters would not have done the job nearly as effectively. M. T. Reed's superintendent, Mr. P. E. Brooks, reports that the mechanics are quite comfortable and are able to perform their work satisfactorily.

Two maintenance men in Dow Chemical Company's large operation at Freeport, Texas, give actual experience and results.

By W. D. MORRIS, Foreman, and W. O. SMITH, Machine Shop B, Texas Division.



Mr. Smith, at left, is holding a polyethylene mold used to cast pump impellers with epoxy and glass laminate. He and Mr. Morris (developer of the mold) are discussing a casting problem.

The authors emphasize the need for boning up on applications and procedure before tackling a new job. Much is known about epoxy, but it is still new and procedures are not completely stabilized.

How Epoxy Can Help You

IN THE TEXAS DIVISION (Freeport) of the Dow Chemical Company, we have found that epoxy resins used in repair, reclamation, and maintenance of various equipment result in important cost savings. A brief description of some of the areas of utility we have uncovered should be of interest to other maintenance groups and may suggest an answer to other problems.

SUCCESSFUL PLANT MAINTENANCE AND REPAIR JOBS

Sea Water Pump

A large centrifugal pump to be installed in sea water service was coated with an epoxy composition inside the impeller housing in an area most subject to corrosion. About 36 square inches was coated.

After 16 months' service, the pump was shut down for repairs and inspected. The epoxy coated surface showed no sign of corrosive action or wear, whereas unprotected areas were corroded away as much as % inch.

Sea Water Pump Suction Housing

The housing had been damaged by corrosion and erosion beyond economical conventional repair. Replacement would cost approximately \$1,800.

The surface was blasted clean. A metal band was welded around the circumference for reinforcement purposes. A mixture of silex and asbestos shorts was troweled onto the surface. All pits, holes, and irregularities were filled with the mixture. A disk sander was then used to get surface smoothness, and a mixture of epoxy and silex was painted over the entire surface of the housing.

The resulting finish was excellent. The total cost of the reworking job was thirty man-hours, including welding, or \$165.00.

Sewer Pump Bearing

The bottom bearing in an operating plant sewer pump had to be replaced approximately every ten days. Because of the inconsistency of the fluid, all bearing materials previously tried failed within this period of time.

A mixture of one part molybdenum disulfide to one part epoxy resin by weight was poured and machined into the required bearing.

The pump has been installed and in continuous service for approximately three months with performance still equal to a new bearing. The bearing has had no lubrication other than that of the sewage fluid pumped.

Water Pump

A chilled water pump was pulled out of the salvage yard. The case was built up with silex and asbestos shorts and smoothed after hardening with disk grinder. The cost was three man-hours' applica-

tion labor. The performance of the pump was equal to a new pump.

Caustic Pump

A caustic self-priming pump has been reclaimed by this shop — using silex as a filler. Pumping performance after rebuilding was equal to a new pump of the same type.

Acidizing Equipment Pumps

Acidizing equipment pumps have been covered inside and out with epoxy to resist corrosion. These particular pumps move a solution of 8% hydrochloric acid, 145 F to 165 F, at 100 pounds pressure. Also contained in the solution are approximately 2% undissolved silicates—approximately 800-1000 mesh.

Asbestos and silex were used as fillers. The impeller was coated, and the case built up and prepared with a grinding wheel. Thus far, 120 hours have been put on the equipment with no sign of breakdown. Previous maximum pumping time was 20 hours for the impeller (Misco C) and 40 hours for the case.

As a severity test, the above pumps were fitted with an open type impeller — to move 23% hydrochloric acid, 145 F at 100 pounds pressure. This impeller was built of solid epoxy. Stranded glass fibers and silex were used as fillers

This impeller performed at 3600 rpm for 80 hours running time before foreign objects were pulled through the intake and into the impeller causing it to be destroyed.

It was found that the impeller needed a large gripping surface to adequately adhere to the hub. A small flange with holes drilled through it was machined into the center of the hub. The epoxy was then poured around the flange to form the impeller.

This proved to be an adequate means of support. The epoxy still adhered to the hub even after all the blades were broken off the impeller by foreign objects. A screen will prevent damage from this source and the vanes can be reinforced if necessary.

Brine Pump

Forms were used in the field to repair a brine pump damaged by erosion. Silex and asbestos shorts were used as a filler. The mixture was poured in place after surface preparation and finished with a hand grinding tool.

Once this type of application has

been perfected, it should be possible to disassemble a pump, remodel the interior, and have it operating within 24 working hours.

Sheave Repair

In some cases, sheaves will not transmit the power requirement without the belt slipping. Tightening of the belts enough to prevent slipping increases bearing wear and often destroys the bearings within a few days.

It has been found that sheaves which are machined clean and painted with epoxy resin and silex filler will maintain a higher coefficient of friction between the sheave and belt. Belts can be adjusted with far less tension and have more traction than is possible without a resin covering on the pulleys. The epoxy also stops corrosion of the sheaves. In some portions of the plant resisting corrosion is the most necessary requirement.

Engine Repair

A crack in the head of a sixcylinder Waukesha engine was repaired with epoxy. The engine is now in service without any seepage of water through the crack. This repair saved buying a new cylinder head.

Non-Skid Surfaces

Catwalks and other areas often require non-skid type surfacing to assure good footing and personnel safety.

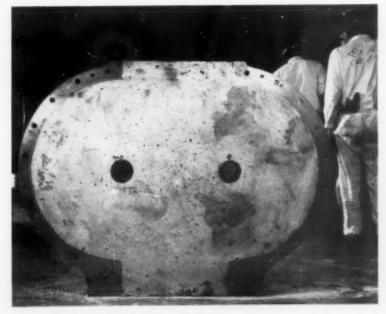
Epoxy filled with approximately 20% by weight of powdered aluminum or ceramic is poured or brushed onto the surface. Flint powder (10-30 mesh) or fairly coarse sand are then sprinkled on and pushed into the resin before hardening has occurred. A long-lasting, highly non-skid deck results.

What, Why, Where and How

These applications prove the unusual adaptability and value of epoxy resin compositions in plant maintenance and repair work. But a listing of such jobs does not adequately explain what epoxy resins are or how they are formulated or applied.

In an article of this size there is not sufficient space to more than briefly introduce the reader

Compressor end plate with epoxy resin build-up. Powdered asbestos was used as a filler. It was machined with high-speed steel and finished by grinding.



to these points. It is recommended that readers interested in experimenting with epoxy compositions in maintenance work in their own plants consult the technical literature produced by Dow or other epoxy resin suppliers.

Insight as to specific proportions of resins and curing agents and fillers, as well as important precautions to be taken because of curing agent toxicity, are amply discussed in this literature.

Epoxy Resins

Epoxy resins are thermosetting synthetic polymers available as either liquid or solid materials. Our work has been conducted with liquid resins produced by the Dow Chemical Company. These resins are cured or hardened by mixing with common amine (DETA, TETA) or anhydride (PA, MNA) curing agents.

As reaction between the liquid resin and the curing agent occurs, a hard, machineable, adhesive, chemically resistant, essentially inert, and dimensionally stable solid is formed.

Application and Curing

Epoxy compositions can be brushed, poured, molded, sprayed, machined . . . whichever best suits the need of the job.

In molding, we have found poly-

ethylene to be the only product which consistently will not stick to epoxy. Some silicone release agents work well; others do not.

Depending on the hardener used, and the mass size, epoxies will air-cure at room temperature in from a few days to two weeks, or they can be oven-cured at 200-225 F in 4 or more hours.

Fillers

The fillers used affect the physical properties of the finished product, the possible methods of application, and the areas of application. Following are typical fillers and comments on them resulting from our own field experience.

It is recommended that any use of this information be tried out in small scale tests first because type of hardener, type of surface preparation, type of curing, and environmental conditions affect each application differently.

Molybdenum disulfide in powdered form — used with epoxy — develops a compound with excellent machineability. A sharp high speed tool steel cutting tool produces excellent work.

First rate bearing materials are made of it. Such bearings require no lubricant, but to keep surface temperatures within normal range, are often used under water — in

plant sewer pumps, sea water service, etc. Thrust bearings made of this material give invaluable service.

When brushed on or used as a surface dip coat for bronze or babbitt-type bearings, this epoxy material greatly extends their service life.

Asbestos shorts as an epoxy filler give fair-to-good machineability; the less asbestos, the longer the tool life. Asbestos filled epoxy is often mixed to the consistency of putty and troweled on.

The excellent adhesive properties make it specially suited for metal build-up of broad, wide surfaces such as large pump impeller housings.

Fiberglass shorts add strength to epoxy in a casting or protective coating, but result in poor machineability. Higher glass content causes high tool wear rates. A carbide cutting tool is essential.

Fiberglass filled epoxy is also used as putty to "tamp down" into a mold for a part of maximum strength.

Silex (ground glass of approximately 1,250 mesh) used as an epoxy filler gives a composition with poor machineability. Grinding with an aluminum oxide deck grinder is a satisfactory method of material removal.

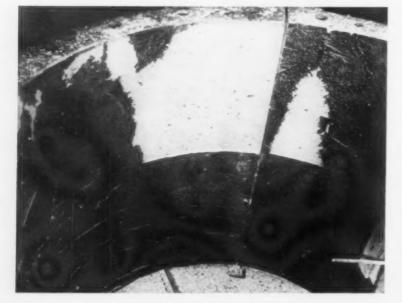
Silex is one of the most useful epoxy fillers. Mixed with asbestos, it gives smoothness to brushing and troweling compositions. Shaft sleeves to be used with mechanical seals are built up with epoxy/silex. Protective coatings on pumps, fan blades, V-belt shafts, etc., made with this composition are excellent.

Because silex is difficult to blend in with epoxy, a high speed drill for mixing is recommended.

Powdered aluminum is used with epoxy as a spreading agent in protective coatings. High concentrations of aluminum are used to build-up aluminum castings into a mixture strong enough to permit subsequent drilling, threading, and tapping. Machineability is excellent and any sharp tool obtains a good machine finish.

Powdered ceramic (80% ground glass and 20% fire clay) is used

This 4 ft \times 4 ft cylinder was built up with epoxy and powdered asbestos. It is being machined in a 7 ft vertical boring mill.



with epoxy to give wear resistance or smoothness to a section. This mixture is used more than any other in castings. Machining should be avoided; shaping by grinding with an aluminum oxide is preferred.

Surface Preparation

The preparation of the part to be mended or repaired will affect the bond of the epoxy to the part, and ultimately the life and service of the repair.

The part should be cleaned thoroughly, by sandblasting or machining, to expose bright metal. If the part has been in contact with caustic soda or an acid, a neutralizing agent to penetrate into the metal should be used.

Conclusion

Epoxy resins are highly useful in the hands of well informed plant maintenance personnel. Through their proper employment, epoxy compositions can be used to salvage, repair, and otherwise extend the life of equipment subjected to corrosive and abrasive environments.

The formulation and application of epoxy compositions in this field

is yet as much an art as a science because of the diverse problems encountered. However, the expense incurred in experimenting with and becoming familiar with these compositions should soon be more than compensated for by the cost savings to be realized from equipment salvage and repair.

Interested plant maintenance people are referred to industrial literature of the resin producers and to epoxy formulators for specific guidance. The authors of this article are willing to answer questions which fall within the limits of their own experience.

Plant Designed Grinder Makes Usuable Material From Scrap

A GRINDER was designed at S. C. Electric & Gas Company's

Plant Hagood, Charleston, S. C. to salvage scrap pieces of asbestos block by reducing them to a usable fibrous form. Asbestos which is purchased in solid block or cylindrical form is used as insulation for the miles of piping at the plant. Piping maintenance requires that this insulation be removed and this usually results in break-up of the blocks into pieces too small for reuse.

In picture #1 we see a piece of solid asbestos being fed into the mouth of the grinder. In seconds By A. J. DESTEPHANO Plant Hagood Charleston, S. C.

it will be transformed into a usable fibrous form. The new material can be used in many various insulating jobs around the plant and is sometimes mixed with refractory materials for boiler use.

The belt driven grinder is powered by an electric motor at 300 rpm and is equipped with an on-off switch. The motor with its protective metal housing is anchored to the base of the grinder. The

grinder itself is supported by four angle-iron legs. The housing and funnel shaped intake are of sheet iron, as is the closed escape chute which carries the ground asbestos to the floor below for bagging. (See Picture #2).

The machine has two grinding sides, one stationary and one revolving. The revolving side consists of an iron disc which rotates on the shaft. Heavy ¾" wire screen with ¾" mesh was welded to one side of the disc and cut so that it covers its area. This side of the disc faces the intake side of the grinder housing. The stationary



side is actually the intake side of the housing to which mesh wire has also been welded. The wire surfaces proved to be very effective for the grinding. The stationary side was welded at an angle so that the material is held against the grinding surfaces until completely pulverized. The finished product then feeds itself into the

chute and drops down to the bagging area.

Photo #3 shows solid pieces being fed into the grinder, and the finished fibre as it is flowing into the bag below. This two-man operation proves very effective and the scrap asbestos is now turned into a useful plant material.

Removable Support for Window Cleaning

THE USUAL step-ladder for reach-

ing plant windows too high to be washed from the ground is at best an unnecessary hazard to personnel, and requires frequent shifting to permit the job to be completed.

One plant superintendent had a pair of brackets bolted to the steel frame members between window sections, the units being so placed as to take light scaffold supports fabricated from 1½-inch pipe.

The removable scaffold supports consist of horizontal members, with one end drilled to take the pin through the upper bracket. The other end is turned upward to form a post, to carry a guard chain threaded through a loop at the top of the vertical member.

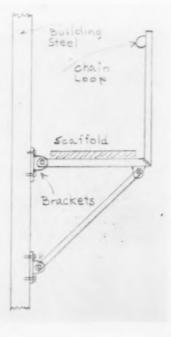
A diagonal brace, pinned to an ear under the outer end of the horizontal member and again to the lower bracket on the building frame, provides stability to the unit.

Scaffolding may be laid across a series of these members, a chain strung through the loops at the tops of the stanchions. Thus a safe scaffold is formed on which the window washer may work in safety, and cover a wide expanse of glass without shifting his work platform.

It is not necessary to provide such scaffold supports for the entire side of a building. The individual support units can be shifted to brackets on the other steel upright each time the scaffold planks must be changed. The wall brackets, of course, extend over all elevated window areas.

By ELTON STERRETT (Tex.)





Accurate Placing of Parts by Crane

ON A LARGE power plant construction job, the motive power being furnished by low head slow speed hydraulic turbines, the large alternator rotors were shipped in halves without the pole pieces being assembled on them. The rotor halves were then clamped about the twenty-four inch shafts with four-inch hot bolts heated in boiling water for hours, then set up by a special crew of well trained men as fast as men could work, using four-foot wrenches and sixteen-pound sledges. The units being of the vertical shaft sort, the rotor and shaft were set up on the floor in that position, the 118-ton weight being balanced on the five-foot diameter flange coupling which was forged integral with the shaft.

The pole pieces were designed to bolt on to the rim with tap bolts. the bolt heads being inside the rim and the pole pieces being threaded to receive them. As the clearances between the pole pieces when placed was so small that no ordinary tackle could be used, it was necessary to make a special steel strap, or loop, which would fit around the pole piece, which when cushioned with a strip of heavy leather belting, could then hoist the pieces to position without damaging the field coils wound on the outside. Each piece weighed 1200 pounds, and try as he would, the crane man could not raise or lower them accurately enough so that the crew could start the tap bolts in the holes.

Spud lining bars through the rim holes were tried, as were also every other means the crew could think of — all to no avail, until someone had a bright idea. He got a one-ton chain fall and hung it on the crane hook, with the chain fall hook engaging the pole piece lifting tackle. Thereafter the crane man set the pole as near as convenient, and the mechanic adjusted it up or down as needed by pulling on the hand chain of the chain falls, until a perfect line-up was secured.

By H. B. McDermid



A Special Reference Section Engineering — Operating — Maintenance

By W. H. MATTHEWS

Supervisor of Instrument and Electrical Design Chemstrand Corporation, Pensacola, Florida

The author's duties include direction of the design of instrumentation systems for Chemstrand's Major Plant Expansion Projects. Before joining Chemstrand in 1951 he was employed by the Dow Chemical Company. Mr. Matthews is a graduate of Davidson College and holds a Master's Degree in Organic Chemistry from the University of Texas. He is a Senior Member of the Instrument Society of America.



Follow These Tips for Measuring Flow in Your Plant

Orifice Meter Installations

ORIFICE METERS using a thinplate, sharp, square edge orifice as the primary element are the most widely accepted flow measuring devices in industry today. This type of instrument is used by the thousands for accurate flow rate determination of nearly every type of fluid.

Satisfactory orifice metering installations depend in part upon judicious selection of the differential pressure measuring device—a recording meter or a transmitter. But the final accuracy of the system is even more dependent upon the care and attention to detail given to the design, fabrication and installation of the flow tube and the primary element which create the differential pressure. Since

these factors are so frequently neglected, this article will deal primarily with the requirements for correct installation of the orifice plate, orifice flanges, pressure taps and meter run piping.

The behavior of a fluid stream passing through an orifice plate is quite interesting. Figure I shows a section of a meter run, with manometers diagrammatically indicating static pressures at various points. Note that the upstream pressure is constant to a point just before the orifice, where it rises to a maximum value at the inlet edge of the plate and then decreases sharply through the bore of the orifice. It drops still more just past the plate and reaches a minimum at a point a short distance down-

stream. The static pressure then begins to increase and the maximum pressure recovery is reached several pipe diameters past the orifice.

The point of minimum pressure is called the *vena contracta* (Fig. 2). Note that the effective diameter of the stream at the vena contracta is substantially less than the actual diameter of the orifice bore.

Theoretical equations for calculating rate of flow through an orifice of known diameter can be derived from Bernoulli's Theorem and the Laws of Thermodynamics, But certain correction factors must be applied to this theoretical equation to take into consideration such things as the actual diameter of the fluid stream at the vena con-

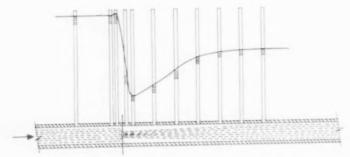


Fig. 1—Pressure Gradients at an Orifice Plate.

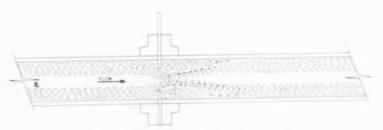


Fig. 2—Location of "Vena Contracta."

tracta, the location of pressure taps relative to the orifice, effects of pipe roughness, and characteristics of the flowing fluid.

The working equations incorporating these corrections have been determined by actual laboratory and field experiments, with all physical details of the test set-ups carefully controlled. The coefficients resulting from these equations can be used with confidence for accurate calculations only when all details of a plant installation are similar to the conditions established for the experimental work. These requirements can be met easily if reasonable care is given to the design and installation of each component of the system.

Meter Run Pipe

Orifice coefficient data have been determined for commercial pipe sizes from 1½" to 30" in diameter. However, the effect of pipe surface roughness on the fluid flow pattern may become quite pronounced for the smaller pipe sizes.

Many plants have established standards which restrict the use of sizes smaller than 2" schedule 80 pipe for standard installations and employ precalibrated meter runs purchased as a complete unit for installations where very small flows must be measured. Precalibrated meter tubes are available in sizes as small as ½" I.D. and are accurate to plus or minus one per cent.

All pipe used in fabricating meter runs should be carefully selected commercial grade straight pipe, free from rust, mill scale and pits. It is not necessary to use internally ground or machine finished pipe on plant installations to obtain good accuracy. The meter tubes used in field calibration tests mentioned above were not machined and since plant calculations are based on the published date obtained from these field tests a meter run using a polished pipe section may actually yield less accurate results than a similar meter run fabricated from good quality mill pipe.

The tables of orifice coefficients are based on standard internal diameters for various weights of pipe. Care must be taken to insure that the meter run to be installed is fabricated using the same size and schedule pipe for which the calculations were based. The actual pipe diameters should be within three per cent or less of the published diameter of the pipe on which the orifice calculations were based if the best accuracy is to be obtained.

Straight Pipe Runs

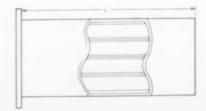
Any major disturbances in the fluid flow pattern introduced by piping geometry, valves or pumps ahead of the orifice plate will produce serious errors in measurement accuracy. In the experimental determinations of orifice constants normal flowing conditions were obtained by using long straight runs of pipe both ahead of and following the orifice plate.

It is recognized that there must be elbows, swages, and valves in any plant piping system. The turbulence introduced by these fittings can be eliminated by making sure that there is sufficient unobstructed straight pipe both upstream and downstream of the metering installation.

A great deal of work has been done by the American Gas Association and the American Society of Mechanical Engineers to establish the minimum permissible straight runs required to overcome the disturbances caused by various pipe configurations. These recommendations are included in their publications on flow measurement (1, 2). The A.G.A. curves relating meter run lengths to types of fittings in an installation and the

Fig. 3—Straightening Vanes. Typical dimensions: d=1/4D or less, L=d x 10.





ratio of orifice diameter to pipe diameter are also found in manufacturers' installation instructions.

In a plant installation, it is most important that the length of straight pipe for a particular meter run should in no case be less than that called for by these accepted standards. Otherwise quite serious errors of an unpredictable nature will be introduced. Any additional pipe cost required to assure a layout meeting these requirements will be a small fraction of the total cost of the metering installation.

Note also that the referenced curves establish only the minimum lengths of straight pipe needed for satisfactory accuracy. It is always desirable to design the original layout with as much straight pipe run as practical. This is particularly important if provision is made to increase the orifice bore at some future date to accommodate higher flow rates. A meter run length of ten pipe diameters may be satisfactory for an orifice-to-pipe diameter (Beta) ratio of 0.5, but as much as twenty pipe diameters would be needed if this Beta ratio were increased to 0.65

A good working rule-of-thumb which will be satisfactory in most cases is to design for twenty-five pipe diameters upstream and ten diameters downstream. However, if it is impractical to provide these lengths for a specific installation the design can be modified to meet the needs of the particular case. But in no instance should lengths of straight pipe less than the A.G.A. minimums be permitted.

Straightening vanes (Fig. 3) are often used to reduce the length of straight pipe required to eliminate turbulence in the flow pattern. A straightening vane generally consists of a bundle of small diameter tubes inserted in the pipe upstream of the orifice plate. Reference to the A.G.A. curves will show that upstream pipe requirements can be reduced by as much as 50 per cent by the installation of these vanes. Even when turbulent flow conditions are not too severe the use of vanes may insure better conditions for accurate measurement and many plants use them consistently on their more critical services.

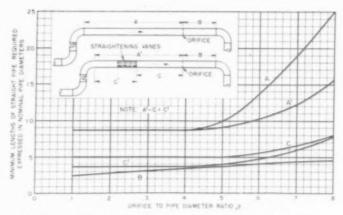


Fig. 4—Typical curves showing required length of straight runs.

It is generally not good practice to install straightening vanes in lines handling fluids which may freeze or plug-up, thereby increasing the problem of cleaning out these meter runs. Also, they should not be used in high-velocity steam lines ahead of pumps or turbines where damage to expensive equipment could result from the breakup of a vane. In these cases the best solution is still a long run of straight pipe ahead of the orifice plate.

A set of curves (Fig. 4) shows how straightening vanes reduce the length of straight runs required for one particular arrangement of meter run piping which may be encountered in the industrial plant. Straight run requirements for other arrangements will vary widely from the figures given in this typical example.

Pressure Taps

There are three basic types of pressure taps employed for measurement of the differential pressure across the orifice plate. These are:

(1) Flange Taps (Fig. 5) have the center lines located one inch from the upstream and one inch from the downstream faces of the orifice plate. In standard commercial orifice flanges the center line of the tap is actually 15/16 inches from the face of the flange and the insertion of a 1/16 inch thick gasket on each side of the plate thus places the taps at the correct location.

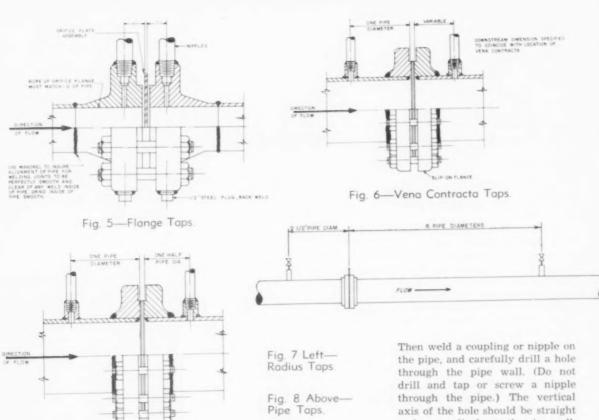
(2) Vena Contracta Taps (Fig. 6) have the center line of the inlet

tap located one pipe diameter upstream from the plate, and the outlet tap located at the point at which the vena contracta occurs downstream. Since the exact location of the vena contracta will vary for each orifice-to-pipe diameter ratio, it is common practice to use "Radius Taps" (Fig. 7) instead of true vena contracta taps. In this case the inlet tap is located one pipe diameter upstream and the outlet (low pressure) tap is located one half pipe diameter downstream from the respective flange faces.

Orifice coefficients established for true vena contracta taps can be used for radius tap calculations with no significant error in results, except at high Beta ratios. Consistent use of radius taps has the great advantage of simplifying construction of meter runs. In practice it is much easier for a pipe fitter to locate all downstream taps one-half pipe diameter from the flange face than if the downstream tap location were slightly different for each meter run.

(3) Pipe Taps (Fig. 8) have the inlet tap 2½ pipe diameters upstream and outlet tap 8 diameters downstream from the plate. One word of caution: The length of straight run required must be measured from the tap locations, not from the plate. Therefore when pipe taps are used the overall meter run length must be at least ten diameters more than required for pipe or vena contracta taps.

Most process plants use either flange or vena contracta taps since they are easier to install than pipe



taps and their measurement accuracy tolerances are slightly better. However pipe taps are still widely used, particularly in the Natural Gas Industry, with entirely satisfactory results.

From a practical standpoint it is generally not possible to use vena contracta taps for pipe sizes smaller than six inches in diameter. The length of a 2", 3" or 4" flange hub is greater than one pipe diameter, which places the tap location in the body of the flange. Flange taps are usually specified for these smaller pipe sizes.

Flange taps are frequently preferred for all meter runs because of the ease of installation. Standard orifice flanges have the pressure taps drilled at the correct location from the face of the flange. All that is required in the field is to weld the flanges onto the pipe sections.

For larger size pipe, savings in fabrication costs of 25 to 50 per cent can be realized by using a vena contracta installation. The plate can be inserted between a

pair of regular pipe flanges, eliminating the need for special orifice flanges. Standard flanges are readily obtainable on any job and, because of the quantities usually involved, they are priced well under the cost of orifice flanges. Check with your purchasing agent.

When vena contracta taps are used extreme care must be taken in installing the pressure connections on the pipe. Conditions on the inside of the pipe must be such that no impact or suction pressure effects will be created the meter must measure only the static pressures in the line on each side of the plate. The hole must be of uniform size through the entire thickness of the pipe wall. Recommended hole diameters are as follows:

Good fabrication practice calls for first locating the center line of the pressure tap at the correct distance from the face of the flange and marking with a center punch.

and perpendicular to the pipe wall. After completion of all welding and drilling operations the inside of the pipe near the pressure tap hole should be ground smooth.

No connections of any kind, except the two pressure taps, should be permitted near the orifice plate in the sections of pipe comprising the meter run. When thermometer wells, pressure gage connections or sample taps are required in the installation they should be installed at least eight to ten pipe diameters downstream of the orifice plate to prevent any disturbance in the fluid flow pattern at the point of measurement.

Installation of Flanges

Care should be used in attaching orifice flanges to the pipe sections. Every precaution must be taken to insure that the inside of the meter tubes in the vicinity of the plate will be smooth and free from any ridges or bumps which might disturb the flow pattern.

Consequently, the internal diameter of welding neck flanges must be the same as the internal diameter of the pipe. For example, 150# or 300# ASA flanges must be used

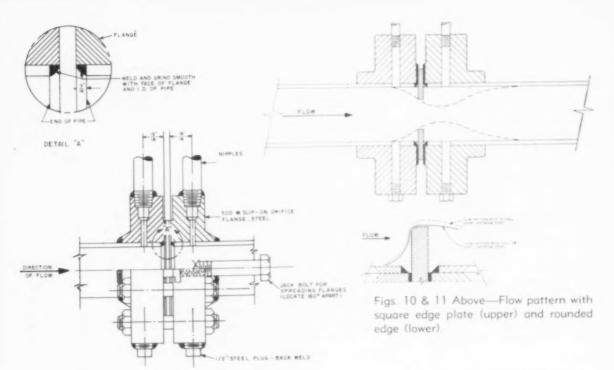


Fig. 9 Left—Installation of Slip-on Orifice Flanges

with schedule 40 pipe; 600# ASA flanges with schedule 80 pipe.

Flanges should be carefully aligned with the end of the pipe. The bore of the flange must be concentric with the bore of the pipe, and the face of the flange must be square and at right angles to the pipe axis.

If slip-on flanges instead of welding neck type are used the end of the pipe should extend through the flange hub to within ¼ inch or less of the flange face. Any remaining groove should be filled by running a welding bead around the end of the pipe inside the flange. (See Fig. 9.)

After completion of all welding operations the inside of the pipe near the flange should be ground to remove all welding beads, slag, humps or ridges. The final clean-up of the pipe is most important and should be thorough in every case.

Finally, the internal diameter of the completed meter tube should be determined by taking at least three measurements across different diameters within one pipe diameter of the end of the pipe. For highest metering accuracy the average of all measurements should be within two per cent of the published internal diameter for the particular grade of pipe, and no single diameter measurement should differ by more than three per cent from any other. The average diameter as determined should be stamped or stenciled on the flanges for permanent identification of the meter run.

The Orifice Plate

The bore diameter of the orifice plate required for a particular installation is a function of the maximum flow, the differential range of the meter, diameter of the meter tube, properties of the fluid, and desired units of measurement. Accurate orifice coefficients have been developed covering orifice-to-pipe diameter ratios over a range of from 0.10 to 0.70. However, from a practical standpoint it is generally better to select a combination of pipe size and meter differential for a given flow which will result in a beta ratio of between 0.20 and 0.60.

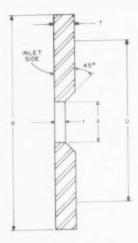
At high beta ratios — say over 0.60 — many of the installation details mentioned above become much more critical. For example, nearly twice as much straight run

of pipe is required at a "Beta" ratio of 0.7 as would be needed for a plate having a 0.5 "Beta" ratio. Similarly, a variation of over three per cent in average pipe diameters is tolerable if the beta ratio is 0.30 or less, but this dimension must be held to within one per cent at Beta ratios greater than 0.65.

The actual diameter of the orifice bore installed should be as close as possible to the value used in the design calculations. A satisfactory rule-of-thumb for most plant work will permit a maximum tolerance of \pm 0.001 inch for orifice bores one inch or over, and \pm 0.0005 inch for bores under one inch.

Materials of construction of the orifice plate should be chosen to provide maximum corrosion resistance to the process fluid. The cost of plates made from type 304 or 316 stainless steel is so little more than for carbon steel or bronze that the stainless plates are generally specified as plant standard for most services. Plates made of other materials, such as Monel, Hastelloy, glass or a laminated phenolic ("Micarta" or "Formica") are satisfactory for highly corrosive services.

The thickness of the orifice plate material should be sufficient to provide adequate mechanical



- B = DIAMETER OF INSIDE OF CIRCLE FORMED BY FLANGE BOLTS MINUS 1/6
- D INSIDE DIAMETER OF PIPE
- DIAMETER OF ORIFICE BORE
- T . PLATE THICKNESS
- 1 PLATE THICKNESS AT BORE AFTER BEVELLING.

Fig. 12—Beveled Orifice Plate.

strength to insure that the plate will not buckle or bend when clamped between flanges or under flowing conditions in the line. For pipe up to 4" nominal diameter, 1/4" thick plate is adequate. Use 1/4" plates for six-inch to 10-inch lines, and %" or 1/2" material for larger lines.

The physical condition of the upstream edge of the plate is most important. To achieve the desired accuracy, it must be sharp and square. Fig. 10 shows the flow pattern and shape of the vena contracta formed by a true square edge plate, while the vena contracta shape resulting from a rounded leading edge is shown in Fig. 11.

Note that even a slight radius of curvature will deform the flow pattern through the orifice and give an increase in the effective diameter of the vena contracta. This would have the same effect on measurement accuracy as installing an orifice larger than calculated, and the indicated flow would be less than the actual flow. Accumulations of dirt, scale or ice on the upstream face of the plate will also produce this same result where the vena contracta is larger than it should be, and the meter will read low.



Fig. 13-Steam Flow Installation. Meter Below Line.

The thickness of the orifice through the bore of the plate is also critical. Generally, the outlet face should be beveled at a 45 degree angle to make the plate thickness through the cylindrical portion as thin as possible (See Fig. 12). AGA-ASME limits for orifice thickness, "t," have been established so that "t" is less than d/8, D/50, or (D-d)/8.

On the basis of pipe diameter or orifice diameter, the beveled portion of the plate should not be more than the lesser of the dimensions shown below:

Pipe Size, D 2" 3" & 4"	Beveled Thickness, t 1/32" 1/16"
6" and over	1/8"
(OR:
	Beveled
Bore Dia., d	Thickness, t
up to 0.375"	1/32"
0.376" to 1.0"	1/16"
1.001" & over	1/8"

Care should be used to center the orifice plate so that the orifice bore is concentric with the pipe except in special cases like those mentioned at the end of this article. In practice this can be done by specifying the outside diameter of the plate blank about %" less than the diameter of the circle formed by the inside of the flange bolts. Plate blanks conforming to standards established by Instrument Society of America will center nicely in 150# or 300# ASA flanges. The O.D. of the plate must be slightly

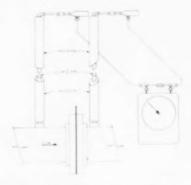


Fig. 14—Steam Flow Installation. Meter Above Line.

smaller for use in 600# or heavier flanges.

Gaskets for use with orifice plates should be cut so that no portion of the gasket will protrude into the bore of the pipe. Stock gaskets on most jobs are frequently a little under-sized, and will not center up properly. It is good practice to use special cut gaskets having the same outside diameter as the plate blank, and an inside diameter ¼" greater than the nominal pipe size. Special holding rings are available for installing orifice plates between ring type joint flanges.

Orientation

Theoretically, the orientation of the meter run will not affect measurement accuracy if other conditions required for a good meter installation are correct. The orifice can be installed in a horizontal run or in a vertical run with flow either up or down.

However, there are some process conditions where performance can be improved by judicious selection of the orifice location. For example, when gas or steam streams containing moisture or condensate are measured, an orifice plate installed in a horizontal run will act as a dam, and liquid will tend to build up ahead of the plate in the bottom of the pipe. If the orifice can be placed in a vertical run of pipe the liquid will be carried on through.

When liquid streams containing air or non-condensable vapors are metered in a horizontal run, gases will collect near the plate along the top of the pipe. This can be

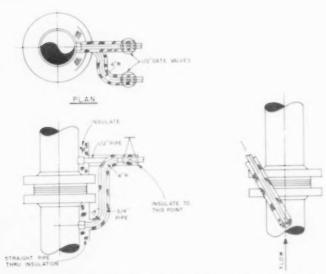
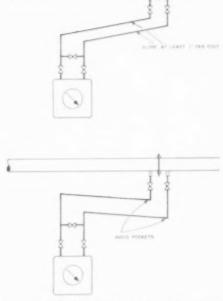


Fig. 15 Above—Pressure Tap Installation. Steam Flow in Vertical Line.



Figs. 16 & 17 Right — Impulse lines should be run with a continuous slope.

prevented by using a vertical run of pipe, preferably with the flow upward. Gases will then be carried on up with the flowing stream and will not collect at the plate.

Recorder or Transmitter

Considerations discussed above covered factors affecting the installation of the primary element of an orifice flow measurement system - the plate and its metering tube. Equal care should be used in locating and installing the measuring instrument which records or transmits the differential pressure. A recording meter should be mounted in a location convenient for an operator to read and to change charts, and readily accessible for easy servicing and maintenance. It should also be located near the orifice plate to keep impulse lines as short as possible.

Most non-indicating transmitters are compact enough so that they could be mounted directly on the pipe line. However, there are other factors which may rule out this type of installation. Frequently the pipe in which an orifice is located is hung from the ceiling or overhead supports, many feet above the floor. A transmitter here could be serviced only from a ladder at inconvenience or hazard to the instrument mechanic.

The instrument supported di-

rectly on the line may also be subjected to shock from water hammer or to vibrations induced in the line from pumps. High frequency vibrations present in many piping systems are particularly harmful to the transmitter. These will cause damage to pivots, leaf springs, nozzles or other critical parts of even the most rugged device.

A transmitter mounted on or near a steam or hot process line may be in an area of high ambient temperatures which might cause a shift in calibration or damage to meter parts.

So in many cases it is considered good design practice to mount the transmitter on a stand or attach it to a building wall or beam rather than support it on a pipe line. The slightly higher first cost will be more than repaid by the ease with which it can be serviced and freedom from the damaging conditions mentioned above.

Meters on gas streams should be located above the orifice to permit any entrained liquid or condensable vapors which might otherwise accumulate in the meter body to drain back into the line. If it is necessary to place the meter below the orifice it may be desirable to install a drip leg or condensate pot below the meter.

On installations measuring liquid flows the meter or transmitter should be below the orifice. This will permit entrained air or noncondensables to vent back into the flow line instead of being trapped in the meter body.

Care with Steam

Particular care must be used in locating the meter on steam flow installations. The meter should be located below the orifice and pressure taps and condensing chambers must be in the same horizontal plane to insure equal heads of condensate in the impulse lines. (See Fig. 13.) If it is absolutely necessary to locate the meter above a steam line, condensing chambers must be installed at an elevation higher than the meter (See Fig. 14) and %" or 1" insulated impulse lines should be run from the pressure taps to condensing chambers above the meter. Lines from the chambers down to the meter body may be uninsulated.

When the orifice measuring steam is in a vertical run of pipe, both condensing chambers must be



Fig. 18—Concentric Orifice Plate

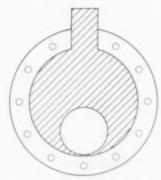


Fig. 19—Eccentric Orifice Plate

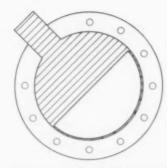


Fig. 20—Segmental Orifice Plate

located at the elevation of the upper pressure tap, and the line from the lower tap to its chamber must be insulated. (See Fig. 15.)

All impulse lines should be run with a continuous slope of not less than one inch per foot of run between the meter and the pressure taps. Flat runs of line or traps or pockets in lines should be avoided. (See Figs. 16 and 17.)

Unusual Orifice Plates

The concentric orifice plate with the center line of its bore coincident with center line of pipe is the most commonly used and most accurate type of primary device for creating a differential pressure. However, when it is installed in a liquid stream containing mud or sand the concentric orifice plate forms a dam in the line which may trap this foreign material ahead of the plate and thus seriously affect the accuracy of measurement by changing the effective pipe diameter. The use of eccentric or segmental orifices eliminates this dam effect, and they can be used with entirely satisfactory results on streams which would otherwise present measurement problems.

The eccentric orifice (Fig. 19) is a circle bored so that one edge is tangent to the larger circle formed by the inside of the pipe. The shape of the hole of a segmental orifice (Fig. 20) is a segment of a circle, again with one edge tangent to the bore of the pipe.

Reliable coefficient data have been developed recently for both eccentric and segmental orifices. These data are not quite as accurate as for the more widely used concentric plates but their use will permit satisfactory measurement of many plant flow streams which otherwise could be metered only with great expense and difficulty.

Specifications for length of meter run, sharpness of the plate and other details discussed above are the same as for concentric orifices, with one exception. Pressure taps for both eccentric and segmental orifices should be located 180 degrees from the point of tangency of the plate and pipe. By using special coefficient data, taps can be located 90 degrees from the tangent point, but the 180 degree point is better.

As noted above, these types of plates are particularly applicable when metering liquid streams containing solid material. In this case the hole in the plate is located in the lower part of the pipe to permit free passage of the suspended material

The same type of installation can

be used to measure wet steam or for a gas stream containing entrained liquid or condensing vapors. For a liquid stream containing small amounts of gas or air, install an eccentric orifice with the opening at the top of the pipe.

Sometimes it is desirable to measure a stream such as river water which may contain suspended mud or sand and also have entrained air. With a concentric orifice the mud would be trapped at the bottom of the plate and air at the top; the combination of both would ruin the accuracy of the results. A segmental orifice installed as in Fig. 20, with its chord at a 45 degree angle to the horizontal plane of the pipe will provide a satisfactory answer. There is a minimum interference to build-up of solids in the bottom of the pipe, and entrained air is not trapped at the top.

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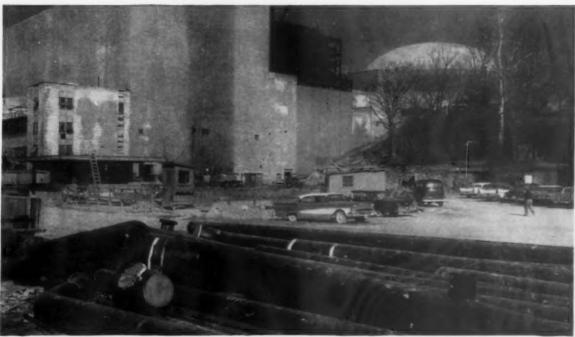
SOUTHERN POWER & INDUSTRY

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INDIAN POINT



Indian Point Station as it looked in April this year, showing some of the piping to be installed by Kellogg's Power Piping Division

NUCLEAR POWER PIPING BY KELLOGG

Construction progress at Consolidated Edison Company's Indian Point Station demonstrates how Kellogg's broad erection experience can take tomorrow's newest and toughest power piping requirements in stride.

At this unique 275 Mw nuclear steam electric generating station, Kellogg has a contract to manufacture, deliver, and to erect all stainless and carbon steel nuclear piping for the inside of the reactor sphere, and all power piping for the conventional portion of this plant. Kellogg also stress-analyzed the major portion of this piping. Much of the stainless piping will be manufactured in Kellogg's Williamsport plant.

The particularly rigid specifications of high quality and close tolerances required the assignment of a special engineering staff to the site. This staff plans, coordinates and supervises each step of Kellogg's erection assign-

ment. One important phase entails over 2200 critical welds, most utilizing Kellogg's K-Weld technique. Another is the radiographic inspection of each weld, which Kellogg is undertaking with its own equipment and personnel.

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Fly Ash Disposal Problem

Solved by Pneumatic Conveyor



THE FLY ASH collecting system at the Gorgas (No. 3) Steam Plant of Alabama Power Co. consists of a complex series of conveyors which dump into a single 380-ton capacity collecting bin. The entire area is closed in by plant buildings and roadways, making disposal of the collected ash a real problem.

In order to load to hopper bottom cars, as well as trucks, a spur line to the main railroad track was put in and a special loading station was erected more than 800 ft from the plant (tracks adjacent to the plant were too busy). Between the plant and the loading station were two roads and four railway tracks. The conveyor would have to go beneath the obstructions in the simplest way possible.

After a thorough study of the problem, engineers decided that the most economical solution would be a pneumatic conveying system. Accordingly, a new conveying line was installed and is now transferring fly ash from the plant to the loading station at better than a ton-a-minute. Major components of the system include a Fuller-Kinyon pump, a Fuller rotary compressor, an 8-in. conveying line more than 800 ft long, a Dracco auto-continuous dust collector, and an Airslide fluidizing conveyor.

Material is delivered to the re-

ceiving hopper of the pump through a motor-operated rotary valve. Leading into this valve are four 9-ft long sections of 8-in. open-type fluidizing conveyors in the bottom of the collecting bin. Each conveyor section consists of a trough-like air-tight chamber set at a slight angle and covered by an air-permeable membrane. Material in the bin rests on the membrane.

Air is admitted into the chamber, filtering up under pressure through the membrane and "fluidizing" the material. This reduces the angle of repose and the material then flows down the membrane by gravity.

Once in the pump's receiving hopper, the fly ash advances through the barrel of the pump where it is compacted — to prevent blow-back — by a decreasing pitch of the impeller screw flights and a variable space between the last flight and a check valve. It then enters a mixing chamber and is fluidized by compressed air introduced through a series of air jets. In this fluid state it is pumped through the pipeline.

Conveying Line Travels Devious Route

The pipeline dips 45° to an underground trench and takes another 45° bend to straighten out in the trench beneath the roads and railways. In the length of this trench there is a downhill drop of 8 ft and another 45° lateral bend.

At the loading station the line rises at 45° up to the top of the open building. Here it veers off at 90° and into the dust collector. The dust collector is a Dracco, two-compartment, auto - continuous

PHOTOGRAPHS

- 1—Gorgas No. 3 Plant of Alabama Power Co. Collecting area for fly ash is at base of stack.
- 2—Compressor supplies air for pump in background beneath bin.
- 3-Conveying line from plant area. Pump is at left.
- 4—Line extends 800 ft beneath roads and tracks to loading station in background.
- 5—Pipe delivers to collector on roof of loading station. Hoppers and loading hose are under roof. Controls are on catwalk.

multi-bag type, protected on top by a weather hood.

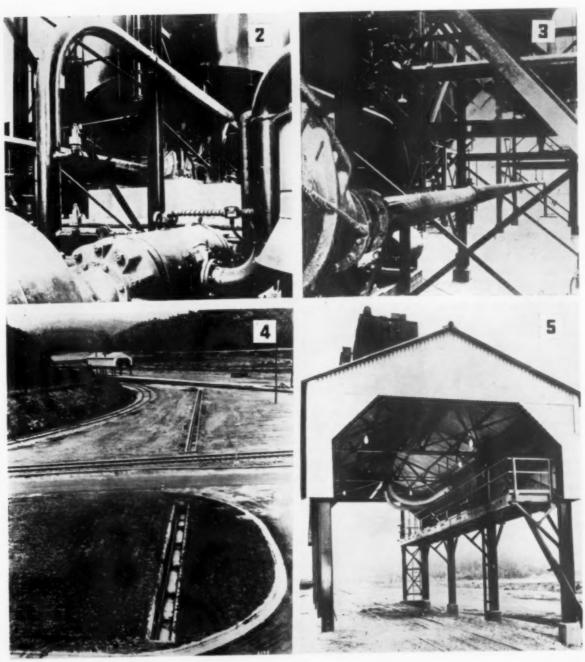
From the dust collector fly ash descends by gravity into a 5-ton capacity holding hopper. Beneath this hopper a two-way diverter with hand-operated "flop" gate directs the fly ash into either one or two 12-ft long 8-in. flexible hoses for loading into trucks and hopper bottom cars.

Two sets of controls are pro-

vided: one at the plant and the other at the loading station. None of the controls at the plant area are operable, however, unless a "Start" button is pushed at the loading station. This is to prevent flooding of loading equipment.

Controls for the pump and compressor are at the plant. A timedelay relay allows the pipeline to clean out with no introduction of new material at the end of a run. All of these controls at the plant can be operated either manually or automatically.

At the loading station are the main "Start" and "Stop" controls. The Start button controls both the pump at the bin and the dust collector. A special "Strip" button here also controls the time-delay relay at the plant. These controls, too, can be adjusted for either manual or automatic operation.



SOUTHERN POWER & INDUSTRY for JUNE, 1960

The Productive Electrical Maintenance Program

Part 2 -- Planning and Scheduling Work*

By W. BARBAROWICZ

Supervisor of Inspection Engineering International Minerals & Chemical Corp. Bartow, Florida

A WORK ORDER system is neces-

sary to establish a scheduled maintenance system. It can accomplish many constructive things: 1) control of work to be performed, 2) control job costs, 3) better organization of work, 4) improved maintenance service, 5) long range maintenance plans, 6) better coordination with production schedules, 7) increase cooperation between departments and trade groups, 8) insure that all jobs, large and small, are completed, 9) assignment of work on a priority system, 10) provide information for many types of analyses and

Work Order Form

There are many ideas as to what constitutes a good work order form. An acceptable form should include:

a. Quadruplicate, with copies for: 1) the originator; 2) electrical department file; 3) electrician, to be returned on completion of the work; 4) originator after job completion.

b. Identification of work: 1) by work order number, 2) by equipment number where applicable, 3) by location, 4) by description of work required. Brief, specific descriptions rather than general descriptions should be used.

 c. Charge numbers — both for labor and material, if different.

 d. Date initiated, date completion required, and completed date.

e. Approval by appropriate supervisor.

f. Show an estimate of labor man-hours. The man-hour estimate need not appear on the original and electrician's copies.

g. Actual man-hours used in completing the work order.

h. References to drawings and/or instruction books, where applicable.

i. Cost of material used. The warehouse will cooperate. A priced copy of all issue slips against any work order can be filed with the work order. These issue slips can be tallied and the total amount recorded on the file copy of the work order.

Work Units

Each work order should cover only one specific job. The only exception is the routine task work order. This should be established once a week for each electrician to establish a charge for the routine items he does during the period.

Large jobs should be broken down into small, natural work units. The work should normally be completed by the same man or men starting the work in a reasonable length of time. For example, a new wound rotor motor and a revision of the secondary grid installation can be broken down as follows:

- a. Stack, assemble, and install new grids.
- b. Install new breaker.
- c. Remove old grids, restack, and reinstall.
- d. Install new motor.

Each of the above jobs should be a separate work order.

*Part 1 of this article appeared in the May issue of SPI and covered functions and purposes of the program and the records and file system.



A single work order covering a large job is synonymous to one work order for a month's maintenance work. Such practices void many of the benefits of a work order system. It makes productive maintenance scheduling an impossibility.

Breakdown of Work

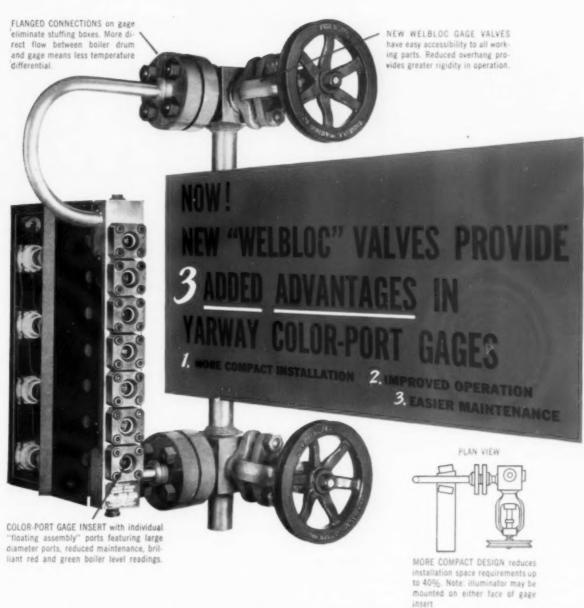
In the absence of adequate work drawings, a step by step description must be made for each operation on the work order. The breakdown must be simple, it must cover all the work and the information must be complete.

Example - Work Order X-7033

Description — Install motor circuit from Size 1 combination starter, Tag No. 7033, behind washer control center to motor, Tag No. 7033, located on lower platform in northeast corner of the washer.

Work required

- a. Use 1" conduit throughout.
- b. Drop from starter through the floor.
- c. Run along west wall of washer to north wall.
- d. Run along north wall of the washer junction box near the motor.
- e. Fasten conduit with two-hole straps at every column.
- f. Use 1" weathertight flexible conduit between junction box and



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motor terminal box.

g. Install weathertight motor control push button station above conduit junction box on north wall of washer.

h. Pull six No. 12 stranded 600 volt, Type TW wires between starter and conduit junction box.

i. Using three wires, connect motor to starter,

j. Using three wires, connect push button station to motor.

k. Install motor overload heaters, Size AY 7.7.

l. Megger motor from starter.

m. Check motor rotation.

n. Get a load check on all three phases.

 Notify operators as to location of motor, starter, and controls.

The above example may appear to be quite complete, but close examination will show that many unit operations are omitted. The question of the amount of detail is a matter of opinion. Theoretically, all unit operations should be included. Practically, this is not possible. Less steps than shown above may be adequate. Additional verbal instructions may be necessary. The only guide is to make it simple, cover all the work and make the information complete. The amount of work done should be easily recognized from the job order at some future date.

Work Order File

A work order log book is necessary to keep track of the work orders. The log should show a) work order number, b) originator, c) date initiated, d) date wanted, e) date completed.

The completed work orders, together with the warehouse issue slips, should be filed by subject index. This file can be of great help for future reference to specific jobs, establishing work standards, estimating costs, training new men in methods and estimating, assist in scheduling similar work orders, and numerous other analytical purposes.

PLANNING & SCHEDULING

There is a common feeling among maintenance men that work cannot be planned in advance with any assurance that the plan will be executed. The argument is that rush jobs and breakdowns continuously interfere with any plans,

WORK ORDER	Date	Job No.
Location end Use	Motor Co. # Starter Co. # Wiring Other	Routine Urgent Shutdown
ITEM AND WORK WANTED		

APPROVED:	DATE SCHEDULED	
ELECTRICIANS REPORT ON WORK DOME		
Date Completed		

A practical Work Order form

thereby wasting planning time.

That argument indicates that the existing maintenance program is falling down and planning procedures are inadequate. Any plan must provide flexibility. The best maintained equipment will break down at times, but a good program will anticipate 90 per cent of the work at least a day ahead.

As mentioned previously, the work performed by the maintenance department consists of:

- 1. Inspection of equipment
- 2. Routine work
- 3. Scheduled assignments
- 4. Emergency work

Inspection of Equipment

Time standards can be established for both routine and periodic inspections. If you know what must be inspected, you can establish the man-hour requirements. The inspection time should be distributed throughout the year to:

a. Assure that the inspections will be performed, a bad operational week could cancel out all inspections if they fell in the same week.

 b. Provide flexibility in manpower distribution.

c. Avoid loading any particular week which would be detrimental to other work.

Daily Routine Work

This work should be assigned on a routine basis. Daily routines should not be assigned on a dayto-day basis. Establish the routine, estimate the time required, allow for it in the daily work load, and follow it with the least interruptions.

Scheduled Work

Except for emergency work, all other work should be planned and scheduled into the daily work load. Emergency work is given top priority over all other work. It can be reduced, but not eliminated. Emergency work is covered later.

The basis of all planning and scheduling is an adequate work order system. No work except assigned routines and emergencies should be done without an approved work order. The planning must cover all the work.

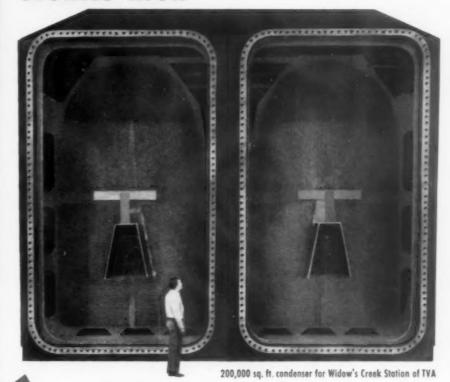
Do not concentrate on only the larger jobs. Small jobs will not take care of themselves. They lie idle for long periods, causing hard feelings.

The work order must provide complete information. Each job must be estimated in advance. Estimating goes hand in hand with planning. Good estimating is the key to maintenance planning. It will provide better work methods. A work order file is an invaluable tool to improve methods and accuracy of estimates.

Establish each job priority by date wanted. Do not accept such dates as "Priority No. 1," "Rush,"

3

STORIES HIGH



or BROAD and LOW

YUBA CONDENSERS—
with the most flexible
tube bank layout in the
industry—designed to fit
any plant or space
requirements

This is a three story high, twin-bank condenser—just one of many tube bank layouts possible with Yuba Condensers—most flexible in the industry. Whether you require a giant condenser or a small one, in a single or multiple pass or axial flow design—no matter what the size, type or service conditions, Yuba's flexible design paces the progress in the power industry.

Yuba's twin-bank tube layout, for example, permits turbine exhaust steam to flow unobstructed, with equal distribution throughout the entire tube bank with a free flow to bottom of condenser and into hotwell, where it reheats and deaerates condensate. In Yuba's deaerating condensers, the oxygen in the condensate is guaranteed to be less than 0.005 cc per liter. This design is patented.

For that extra performance, Yuba staggers the tube support plates—reducing harmonics—eliminating vibration. This is just another reason Yuba surface condensers have been installed all over the world in plants of many sizes. For full details, contact Yuba today.

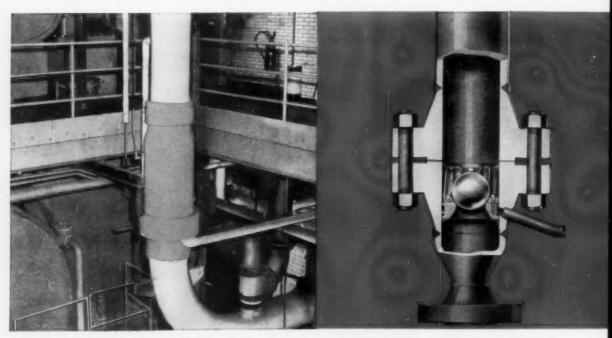
Other Yuba products for steam power plants include Feedwater Heaters, Evaporators, Expansion Joints, Cranes, Tanks, Structural Steel and scores of other items.

specialists in power plant equipment



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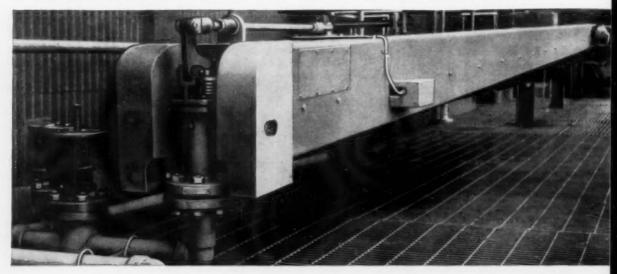
New Variable-Orifice Desuperheater holds reduced steam temperatures constant only 20 feet downstream from desuperheater outlet—regardless of changes in initial temperatures or rate of flow. No long runs of piping or spray nozzles are required. Other types are available, each engineered is particular operating requirements for steam service conditions through 2500 psig and 1100 degrees F. Write for Bulletin 1037.

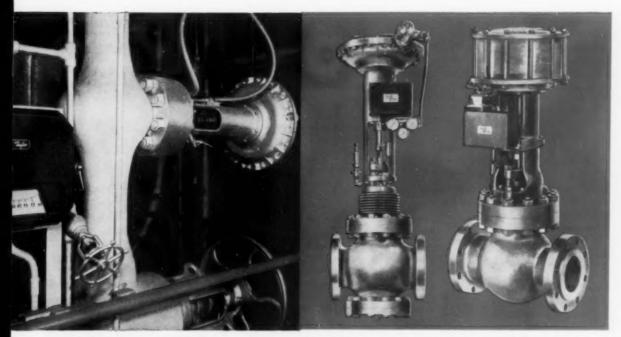
Copes-Vulcan equipment

With the country's electric power demand doubling every decade, power plants must operate with higher and higher efficiency. Boiler and boiler controls must be more closely integrated than ever before.

To meet these needs, Copes-Vulcan produces a complete line of control systems for superheat and reheat temperatures, feedwater, combustion, pressure reducing and desuperheating operations. Available in separate units or integrated into a single package, these systems are custom-engineered to meet individual needs, and backed by over 50 years of design experience. For details, write Copes-Vulcan Division, Erie 4, Pennsylvania.

Automated soot blowing. Vulcan Selective-Sequence Control Panel (at right) permits varying the operating sequence of electrically-driven soot blowers. Also available: Automatic-Sequential systems. Write for Bulletin 1029. The 35 foot Vulcan T-30 Soot Blower (below) has a dual-motor drive for thorough cleaning of all surfaces. Part of a complete line of soot blowers and wall deslaggers. Write for Bulletins 1030, 1034.





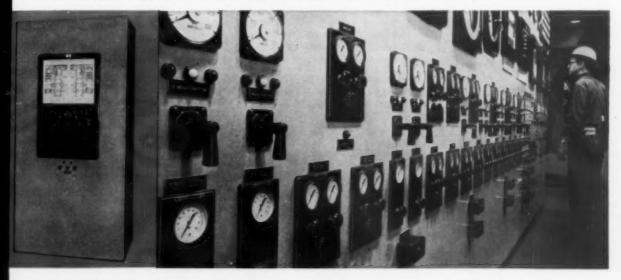
Boiler feed pumps are protected by this Copes diaphragm-operated by-pass valve. Also available: piston-actuated valves for use where valve operating force must be unusually high, and positioning precise. Both types, designed to meet pressure standards of 125-pounds through 2500-pounds, after excellent rangeability. Each is job tailored for accuracy and dependability. Write for Bulletin 1027.

boosts power plant efficiency

*Thermal and nuclear: besides intensive commercial product development, Copes-Vulcan is skilled and experienced in the design and manufacture of special products such as valves for the Navy's nuclear submarine program and for nuclear-powered electric generating stations.

Copes-Vulcan Division BLAW-KNOX

Boiler control provides high speed response, simplicity of circuits and accuracy of components. Graphic panels centralize boiler operations at operator's fingertips. Combustion control may be from steam flow-air flow, or from fivel-air ratio. Feedwater control may be from one, two or three influences to maintain a stabilized water level regardless of changes in load or feed pressure. Write for Bulletin 1038.



or "Soon as Possible." Do not take from jobs in process to favor one that appears more important without investigation. The urgency will frequently melt under investigation, and you can assign men to the job in an orderly manner.

Get production and maintenance men thinking in terms of realistic "date wanted." Work on the understanding that you will meet these dates, or will notify the people in advance of the date if it cannot be met. This will improve relations and eliminate phony rush orders.

Begin your planning as soon as the work order is received. Estimate the job and establish the "start" date to meet the "wanted" date. If you cannot meet the "wanted" date, re-negotiate that date with the originator.

Lay out your work as far in advance as practical. The work is scheduled as rapidly as available man-power allows. The work must be planned a minimum of one day in advance for each electrician and helper for each day. Required tools and materials should be made available at the job site, or on the truck prior to the start of actual work.

After establishing the schedule:
a) Keep informed on progress, b)
Direct your attention to the jobs
which are behind, c) See what effect rush jobs will have on your
schedule and which jobs can be
conveniently delayed if necessary,
d) Keep operating personnel informed.

With this type of planning and scheduling, little jobs will progress along with big jobs. You will reduce interruptions to jobs in progress. The electricians will develop more pride in their workmanship by seeing one job completed, and then moving to the next.

EMERGENCY WORK

Any work performed by the department which is not routine, or scheduled, should be classified as emergency. Daily work schedules should be prepared at least one day in advance, anything which requires deviation from this schedule should be classified as emergency or trouble.

Emergency work is undesirable and is highly inefficient for three reasons:

 It has to be done without a complete study of work methods and planning. Time is lost in checking the emergency, then gathering the necessary tools and materials. 2. Other jobs have to be stopped to draw off men for the emergency.

3. Emergency jobs are usually performed under extreme pressure from operating people or engineers. This leads to sacrifice of quality of work.

TO MINIMIZE EMERGENCY WORK:

1. The electrical maintenance superintendent should make an immediate investigation, where feasible, in an effort to postpone the job until it can be efficiently scheduled. This contact with associates can help sell the idea of productive maintenance and discourage unwarranted rush jobs.

2. Establish an after-the-job control on all rush jobs that were not investigated prior to the job. In doing so, it must be realized that some interferences are normal. Equipment failures will occur no matter how well equipment is maintained. All schedule-breaking jobs that are not bona fide breakdowns, or prevention of immediate breakdowns, should be referred to the appropriate supervisor for his comments. Adequate inspections and frequent contacts with the operating departments should minimize unnecessary rush jobs.

 Make a trouble report for each non-scheduled job. The illustration shows one form of a trouble report.

4. A reproducible tally sheet on the classification of troubles should be maintained. This should be a columnar form. A full month should appear on each sheet. The first column should tabulate the date. Subsequent column headings should classify the troubles.

A partial classification should include:

a—Starters	j-Substation
b-Motors	k-Hand tool
c-Transformers	l—Telephone
d-Fuses	m-Cable
e-Breakers	n-Lines
f-Controls	o-Lightning
g-Wiring	p-Planning
h-Lighting	q-Operator
i-Ballasts	r-Misc.

This tally sheet will highlight recurrent troubles so that steps can be taken to eliminate them. It will also provide an easy guide for future cross-reference to the reported trouble in the work log for the location involved.

WORK LOAD CHART

A work load chart is useful in long range planning. It is a weekly chart projected as far into the future as possible. It shows when work is required and how much capacity (man-hours by the week) is available to do the work. It should include:

- 1. Man-hours available.
- 2. Scheduled inspection time.
- 3. Scheduled routine assignment.
- Assigned scheduled work orders whose "start" date falls within that week to meet the "wanted" date.
- Assigned scheduled work orders with no date wanted, or ahead of schedule.

This chart is a valuable tool in:

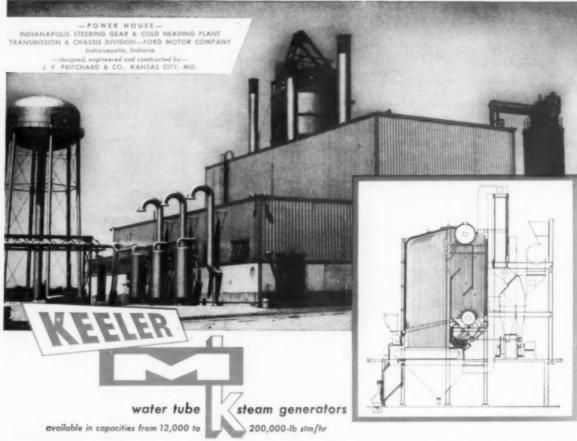
- 1. Showing need for overtime during certain periods.
- 2. Showing need for sub-contracting.
- 3. Showing need for changing the strength of the maintenance force
- Planning large repair jobs or overhauls between heavily loaded periods.
- 5. Enabling the planner to make accurate promises for future work.

DUTIES OF PERSONNEL

In addition to the electricians who perform the assigned work, the following people are available in the department to execute the productive maintenance program:

1) electrical maintenance superintendent, 2) electrical maintenance supervisor, 3) clerk.

A successful program requires cooperation, mutual assistance, and understanding among the men of the department. Even if a clear-cut definition of duties and responsibilities were possible, certain periods would occur when they must aid each other. The duties



95 years of design and manufacturing experience provides the basis for steam efficiency and economy at Ford plant

Three Keeler Type M K Steam Generators are serving Ford's Indianapolis Steering Gear & Cold Heading Plant with complete satisfaction on all points. They were selected for their ability to economically deliver 300,000-lb stm/hr for the plant's entire process, heat, hot water and auxiliary equipment requirements.

Two of the M K's are 120,000-lb stm/hr and the other is 60,000-lb stm/hr, 160 psi design pressure. They are equipped with air preheaters and spreader-stokers with continuous ash discharge, for bituminous coal firing—providing as modern and efficient a power facility as the manufacturing plant itself!

Keeler M K Steam Generators offer many efficiency and economy advantages! They are fully top supported, cross drum type with provision for downward expansion to eliminate any stresses being conveyed to the boiler proper, the steam piping or auxiliary equipment. Radiation losses are held to an absolute minimum with water cooled, completely steel encased and insulated furnace walls and roof.

Write or phone for complete information...Keeler M K's are available in capacities from 12,000 to 200,000-lb stm/hr—for high efficiency with any firing method or control system.

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No. MK-1: Type MK Boilers No. DK-2: Type DK Package Boilers No. F-14: Type CP Boilers No. M-2A: Type CPM Package Boilers





ONE OF THE NEWEST PLANTS in the Ford Motor Company's Transmission & Chassis Division, the Indianapolis Steering Gear & Cold Heading Plant is Ford's biggest producer of steering gear units for all company cars and trucks, and one of the largest cold heading operations in the world. The main building comprises more than 1,400,000 square feet of floor space—housing production, office and various employee facilities, including a fully staffed hospital and three cafeterias.

- ESTABLISHED 1864 -

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(Continued from page 54)

and responsibilities can be approximated as follows:

SUPERINTENDENT

a. He is the head of the department. As such, the responsibility for the overall performance of the department lies on his shoulders. He has the authority to issue orders necessary to the successful execution of the departmental function.

b. He sees that such records and reports as are required by personnel and management are maintained.

c. All communications to higher channels or other departments must be cleared through him.

d. All overtime work must have his approval except in cases of emergency.

e. He should approve all plans and work.

f. He should keep the warehouse advised as to what spare parts and how many of each to keep on hand. g. In addition to the normal functions of the department, the superintendent 1) Analyzes all work orders, 2) Determines the work to be done and breaks it down into work steps, 3) Estimates the man-hours required. 4) Reviews the completed jobs and revises the estimate based on actual experience for future reference, 5) Establishes priorities, when necessary, 6) Makes an immediate investigation of emergency jobs.

SUPERVISOR

 a. He is responsible for inspections, routine work, and scheduled work.

b. He is directly in charge of the men except at such times his supervisor assumes charge.

c. He a sists in breaking down requests into work steps and estimating the man-hour requirements.

d. He determines plans and material requirements from the work request.

e. He schedules all work at least

one day in advance for each man for each day.

f. He re-schedules and adjusts work to suit the urgency of new and emergency work.

g. He observes progress of work and keeps others informed.

h. He maintains the work load chart.

He makes an immediate investigation of emergency jobs.

j. He reviews all trouble and inspection reports and brings them to the attention of the assistant maintenance superintendent.

k. He sees that all operational and equipment logs and records are properly maintained.

1. Reviews all labor charges and time reports.

m. Dispatches the men.

CLERK

a. He is responsible for all typing and clerical duties.

b. He maintains necessary personnel and timekeeping records.

(Continued on page 61)

Keep heating costs low with HEV-E-OIL commercial-industrial burners

Hev-E-Oil burners furnish all the air necessary for combustion, assuring perfect fire control under all weather conditions. Low fire start that builds up gradually to the flame size required means smooth, safe operation. And once the burner is set for greatest efficiency, it *stays* that way no matter what the weather.

A complete package! Fire tested! Automatic, electronic controls. Meets all codes. Easy to install . . . Hev-E-Oil models from 5 to 150 gph. Also available, Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 B.T.U.

For more information write Industrial Combustion, Inc. 4507 N. Oakland Ave., Milwaukee 11, Wis., Dept. SPI 60.



INDUSTRIAL COMBUSTION

EXECUTIVE OFFICE: 4507 N. OAKLAND AVE., MILWAUKEE 11, WISCONSIN

Maintenance and Steam Traps

... there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

- 1. Be sure it's the right type of trap.
- 2. Be sure it's sized right and is for the correct operating pressure.
- 3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

- Install them so they are accessible for inspection and maintenance.
 - 2. Install a test valve.
 - 3. Use a union or unions.
 - 4. Use a shutoff valve or valves.
- 5. Use a strainer ahead of the trap if dirt conditions are bad.
- Use a by-pass only where continuity of service is imperative.
- Standardize inlet and outlet connections.

Preventive Maintenance Program

- 1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)
- Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance... testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

Good traps save steam and reduce the load (and consequently maintenance) on fuel handling and HERE'S THE STEAM TRAP DESIGN
THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS

AIR

CONDENSATE

Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate. Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid—less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

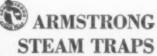
The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenancereducing advantages:

Armstrong Traps are dependable.

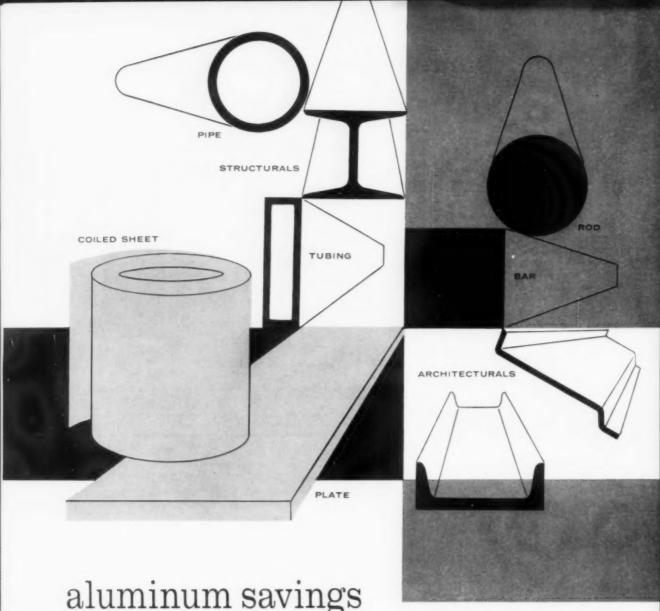
- 2. Armstrong Traps require no adjustments go from full load to zero load automatically.
- Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.
- Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.
- Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works 8063 Maple Street Three Rivers, Michigan



(See our catalog in Sweet's Plant Engineering File



aluminum savings ...and service



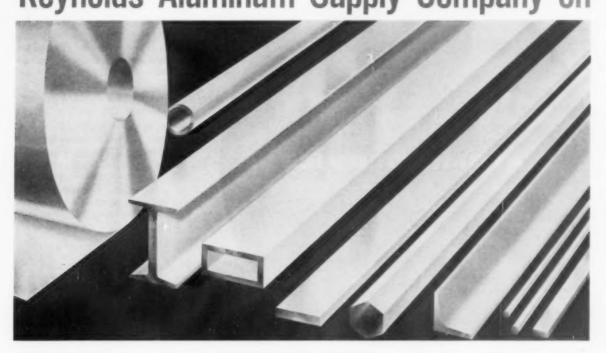
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Your Reynolds Distributor stocks the aluminum most in demand in your area—and he can get it to you fast. He can offer sound, cost-cutting technical advice, as well.

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We supply Aluminum, that's our business. Whatever you need in Aluminum Mill Products: plate, flat & coil sheet, extrusions, rod, bar & shapes, tubing & pipe, you can find it at your nearest RASCO service center. You'll also find men who know aluminum, know how to give you the best technical assistance available, know how to save you money. Your orders are filled quickly because each warehouse maintains complete stocks. Shipments are processed by a modern traffic system, the best in materials handling equipment, and our own fleet of trucks.

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Your eleven Reynolds Aluminum Supply Company distribution centers carry complete stocks of Reynolds Aluminum pipe, structural shapes, sheet, plate, bars, rods and architectural extrusions.

Reynolds Aluminum Supply Company is your ONE-STOP source of supply for all Aluminum Products.

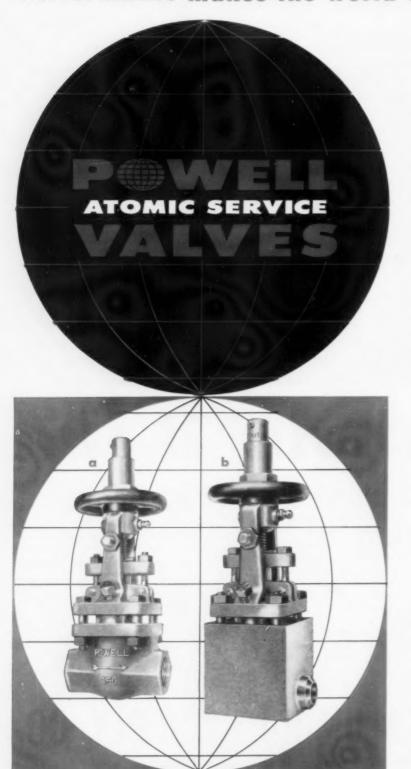


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Performance makes the world of difference



In step with the times, Powell designs and makes valves to successfully handle the fluids that are necessary in the operation of atomic power plants, submarines and merchant ships.

These valves are absolutely leak tight and can be depended upon to render long unfailing service the result of Powell's constant quality control of materials and manufacturing methods, precision machining, cleaning and degreasing of all parts, and thorough testing.

For complete information consult your nearest Powell valve distributor or contact us.

G

Stainless Steel Screwed End Globe Valve for 150 pounds W.P. Because of the specially designed stuffing box, and the special gasket at the bodybonnet joint, these valves are absolutely leak tight. Provided with an extension stem coupling for remote operation.

b

Stainless Steel Block Type Globe Valve for 300 pounds W.P. Butt welding ends. Inner Bell-o-Seal construction protects lower section of stem against any corrosive action of the fluid being handled and makes the valve packless. Valves are fitted with an extension stem coupling so they can be remotely operated.

THE WM. POWELL COMPANY Dependable Valves since 1846 Cincinnati 22, Ohio

Powell . . . world's largest family of valves

(Continued from page 56)

- c. He maintains logs and records as required.
 - d. He performs filing duties.
- e. He dispatches men to emergency breakdowns in event the superintendent or the electrical maintenance supervisor are not available

RECOMMENDATIONS

You cannot adopt cures until you know what requires maintenance. Where equipment records are incomplete, make a complete physical inventory of all the electrical equipment by areas.

This inventory should give equipment number, location, ratings and nameplate data, condition, age, and importance to production.

Performing the inventory is an excellent job for a new man. He learns a great deal about the plant and equipment. An observant engineer should catch a lot of repair items throughout the plants which

are overlooked daily. He will need the assistance of an electrician familiar with the plants.

Large electrical manufacturers offer the services of a qualified engineer to make a physical survey and help establish productive maintenance programs. The services of an electrician familiar with the plants would be required.

Other arrangements should be made to make this survey if neither of the above is feasible. The survey should not be delayed.

Checks and Records

Simultaneously with the survey, routine and periodic inspection check lists should be made for each type of electrical equipment. Time standards should be established for these inspections.

An area tally should be made of all types of equipment. Based on eastablished time standards, a man-hour requirement should be established for area inspections.

A standard form should be adopted. Data from the physical survey can be entered on the standard form.

All existing and recommended forms should be reviewed. Elimination, combination, simplification, and improvement should be the objective. Those considered useful should be adopted. Forms that present useful data to management should be reproducible. Disposition and distribution of reports should be determined.

All this may sound like a lot of paper work. It is. It's paper work aimed at getting things done; paper work to aid the department in carrying its managerial responsibilities; paper work to insure toplevel interest by adequate reports.

A good work order system costs so little and offers so much. A work order system should be initiated immediately.

Communications

The most effective way to "sell" the maintenance department is by every day contact with associates across-the-line and up-the-line. A brief personal check and discussion should be held with the departments being serviced frequently. Once they are convinced you are trying to do a good job, the battle is won. They will sell maintenance to management for you.

Communications with the men must not be overlooked. Bi-weekly departmental meetings should be held. These meetings are considered important at higher levels. If they are worthwhile at the top, they can be of great value at the bottom.

The meetings can be used to discuss and improve:

- 1. Housekeeping
- 2. Safety
- New installations they should be familiar with.
- Uncommon troubles and how they were found and repaired.
- Training and instructions for the more complex controls.
- 6. Explanation of procedures
- 7. Exchange of ideas
- 8. Gripe sessions
- Progress on reduction of downtime and emergencies.
- Other company information that affects their job and can be disclosed.
- Discussion of plans and coordination of work on large jobs.

One form of Trouble and Downtime Report

	ND DOWNTIME .
RE	PORT
LOCATION	DATE
	TIME
INSTALLATION	IMACC EQUIP. NO.
NATURE OF TROUBLE	
NATURE OF REPAIRS	
DID TROUBLE CAUSE ANY DOWNTIME?	
WAS CORRECTION OF TROUBLE TEMPORARY?	
IS ANY FURTHER ACTION NECESSARY?	
REMARKS	
	SIGNATURE



"Cheap and dirty" coal...



.a premium performer in the

B&W Cyclone Furnace

Low-cost, unwashed, high-ash coals actually aid efficient combustion in the B&W Cyclone Furnace

Low grade coals are effectively fired in the B&W Cyclone Furnace with a continuous high velocity blast of secondary air, causing a cyclonic turbulence. Ash in the coal is melted to form a viscous fluid bed around the cylindrical furnace walls. This slag bed traps incoming coal on its surface, letting the high velocity secondary air scrub the coal, burning out maximum Btu's. More than 80% of the ash is trapped in this liquid slag and tapped into slag tanks before entering the secondary furnace.

So—the high slagging characteristics of low-cost, unwashed, low-fusion-temperature coals make them an especially attractive fuel!

In addition, B&W Cyclone Furnaces offer all of the following advantages:

- Simplification of coal burning equipment
- Less atmospheric pollution
- Elimination of fly ash handling and disposal problem by reinjection system as a part of the unit
- · Less space, smaller building
- · Less maintenance and cleaning
- · Safer operation, simpler remote control
- Increased availability

The unit under construction on the left is one of the more than 325 B&W Cyclone Furnaces to be erected to meet the increasing needs for maximum efficiency of energy conversion in the power industry. We would welcome an opportunity to put the advantages of a B&W Cyclone Furnace in your language. For further details, please contact your local B&W representative... or write for B&W Bulletin G-65. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

G-965



THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

Chlorinated Solvents Are Poisonous

solvents in industry points up a need for the development of effective controls to curb the health hazards involved. The number of

hazards involved. The number of such chlorinated solvents is increasing daily because they are effective to dissolve oils, fats, waxes and fatty acids in addition to being nonexplosive when vaporized. Among the more common are:

Methylene Chloride or Dichlorethylene

Chloroform

Carbon Tetrachloride

Trichlorethylene

Per (tetra) Chlorethylene

Ethylene Dichloride

Trichlorethane

Different manufacturers sell these products under their own brand names.

A list of typical processes requiring use of the solvents are: Manufacture and application of some waxes, polishes, lacquers, paints and varnishes. Extraction of oils, fats, and waxes. Degreasing metal articles. Dry cleaning. Manufacture of some rubber articles. Cleaning in garages or equipment shops. Use in chemical laboratories in conjunction with dry ice for temperature reduction.

How the Poisoning Occurs

Most exposures occur through breathing of the vapors, or from long or repeated contact of these liquids with the skin, or from swallowing them.

As many of these solvents evaporate readily, the fumes spread through work areas very readily. The vapors cause irritation of the eyes, nose, throat, and lungs.

The liquids remove the natural oil from the skin and thus may cause local damage. When these substances are absorbed into the body they cause damage to the liver and the other vital organs. The damage is in direct ratio with the severity of the exposure.

It is extremely important to remember that the signs of internal poisoning are often long delayed. Chronic poisoning results from long continued exposure to small amounts of chlorinated solvents. Acute poisoning occurs from breathing large amounts of the vapors for a short time. These solvents should never be taken internally.

Warning Signs

Smarting of the skin, burning of the eyes, and irritation of the nose and throat warn of dangerous exposure. The signs which give warning of poisoning are headaches, loss of appetite, nausea and slight mental confusion. As symptoms of poisoning by chlorinated solvents are often delayed, a worker may feel much better after being in the open air and yet be dangerously ill some hours later.

Recommendations

When a worker complains of illness that may be traced to use of a chlorinated solvent he should be given immediate medical attention to determine how seriously he has been exposed. Medical science has ways and means of combating the effects of recent exposures. This is not always true for the delayed cases. If the worker has ceased to breath, artifical respiration should be started at once before transportation to the hospital.

It is strongly emphasized that early discovery and early treatment make for a shorter and more curable sickness. Don't wait until the damage is done, since late treatment for chlorinated solvent poisoning is frequently very slow in gaining effective results. The long period of disabling illness is coupled with a great deal of personal discomfort.

Precautions

(a) Instruct all employees in the hazards common to the use of chlorinated solvents and the precautions to be observed in their handling and use. Such instructions depend upon learning the specific composition and hazards of the solvents being used.

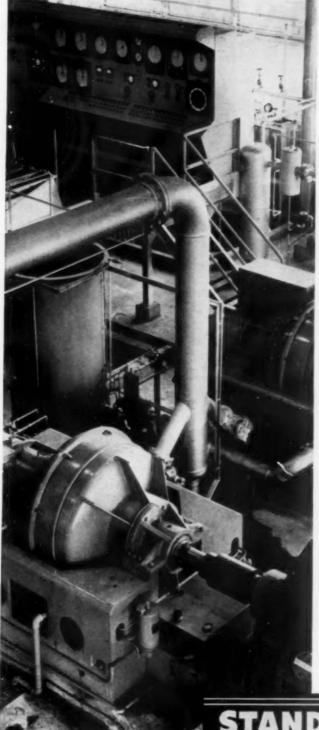
- (b) Provide periodic medical examinations for the workers whose occupations involve exposure to chlorinated solvents.
- (c) Encourage workers to report early signs of injurious exposure.
- (d) Remove escaping vapors by local exhaust in such a manner as to prevent contamination of the work room atmosphere. Excessive quantities of chlorinated solvents in the atmosphere are indicated by their odor, or by the smarting sensation of the eyes and nose.
- (e) Maintain all ventilating and other protective equipment in an efficient manner by regular inspections and service.
- (f) Post signs warning of the hazards of entering oxygen deficient rooms or tanks until these are thoroughly purged of all fumes. Even then do not depend entirely on the effectiveness of the general air exchange created by fans, but do insist that workers entering such rooms or tanks also be equipped with air line masks, rescue harness, and be under the constant supervision of an outside observer or attendant. If you elect to use gas masks in place of the air line mask, see that the mask has the approval of the U.S. Bureau of Mines, and that the cartridges employed are fresh stock and safeguarded with safety seals over the vents. This seal must be removed at the time the canister is inserted in the mask. Fatalities have occurred where in the excitement of the moment canisters were plugged into masks with the seals still intact.

Conclusion

Here is the final summary of recommendations offered.

- Help the management maintain safe working conditions.
- Use all equipment and safety devices furnished for protection.
- Avoid all alcoholic beverages, as alcohol increases the hazard ten-fold.
- Refrain from working in solvent contaminated atmospheres if not in good health.
- Establish periodic medical examinations for regular workers in solvent atmospheres.

By PAUL C. ZIEMKE, Oak Ridge, Tennessee



experience has a cash value

In serving Southern industry with dependable lubricants for seventy-four years, our lubrication engineers have acquired experience that can be valuable to you. This experience is backed up by the combined facilities for testing and research behind Standard Oil lubricants that are unequaled.

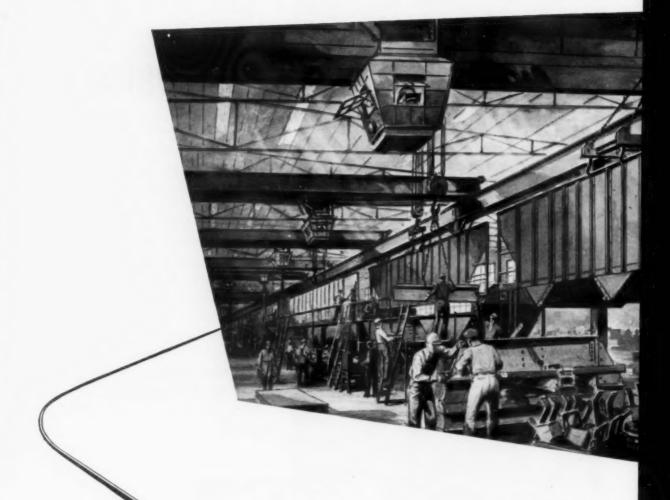
Whatever your requirement may be — there's a Standard Oil lubricant designed to do your particular job with economy, dependability and efficiency.

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85-ton hopper cars



for faster, more efficient coal delivery

The nation's largest coal-carrying hopper car fleet is being expanded by the new N&W! Orders recently were placed for 1,000 85-ton roller bearing hoppers, the first ordered by a U. S. railroad.

King-sized capacity of these cars means the N&W can deliver your coal faster, more efficiently. Advanced design of the big new hoppers will give them a life span of 5 years more. They start rolling from N&W shops in August, with deliveries completed by the end of the year!

Constantly improved coal handling facilities and service is another reason why it pays to buy the quality coal from mines along the lines of N&W! Get the facts from your N&W coal traffic representative.

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GENERAL OFFICES, ROANOKE, VIRGINIA



Automatic Gauging Device

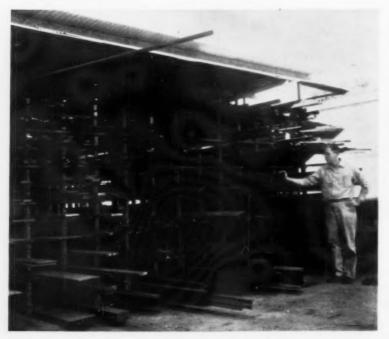
QUALITY of McCormick mechani-

cal cotton pickers manufactured by the International Harvester Co. plant at Memphis, Tenn., is now guarded by a special new automatic gauging machine, capable of detecting an error within one ten-thousandth of an inch.

Installed at a cost of \$13,500, the gauging machine was designed and built especially to measure the outside diameter of cotton picker

THIS STEEL RACK, made from discarded boiler condenser tubes we had around, keeps over 125,000 pounds of steel in order for quick selection and easy inventory. All supports are welded.

By S. CLARK, Maintenance Supervisor, U. S. Phosphate Co., Tampa, Florida.



spindles — the metal "fingers" that actually pick the cotton.

After spindles pass through the final manufacturing operation, chrome plating, a conveyor moves them to the gauging machine which picks up each spindle and measures it for correct size. Approved spindles are deposited on a belt conveyor that slowly turns the spindle as it moves past an inspector for a visual check. Rejected spindles are automatically divided into two groups — undersize and oversize.

Chief Inspector Charles S. Cuyler says the automatic gauging machine gives faster and more accurate measurement of the 2,000,000 to 3,000,000 spindles produced by the Harvester Memphis plant each year.

How To Find Density of Coal in Storage

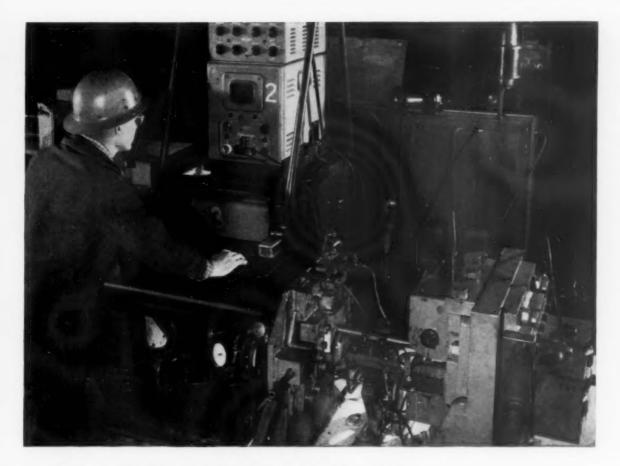
SOME difficulties are experienced in attempting to simulate actual conditions when measuring coal densities.

On our system, we crush coal and stock pile it with a bulldozer. This not only packs the coal and helps shed water, but helps to keep out a free flow of air and the subsequent loss of volatile matter. It also minimizes coal pile fires. Determining the density of such a prepared pile, which averages 100,000 tons in our case, presents many problems.

In very high piles it is uneconomical to attempt a measure of density at the bottom center. However, on average heights of 20-25 feet, we do go down as far as 10 feet in a few places with the 'dozer for a few of the many sample points. Wherever the sample is taken, we follow one of the following methods.

All loose coal (or coal above a desired elevation) is removed in order to present a reasonably flat level area about three feet by three feet. A piece of plywood (about 2' x 2') with a roughly circular hole about 18" in diameter is placed on this flat area.

Then coal is removed, shearing down vertically around the inside



How to inspect electric welded tubing with ultrasonic sound waves

National Tube tests all USS National Electric-Resistance Welded Pressure Tubing with ultrasonic sound waves. As the tubing slides directly over a ground quartz crystal, electrical pulses are focused on the weld area. The crystal changes these pulses into ultrasonic vibrations which bounce off the the weld and reflect its strength or weakness. The vibrations are speared by the crystal, converted back into electrical energy, and floated across an oscilloscope screen.

If a bad weld is reflected, the electrical current dances wildly on the screen and triggers an alarm system. The crooked pattern is pen-recorded on a graph, a frog-voiced horn croaks loudly, and the tubing is squirted with black paint to mark the defect.

In case the ultrasonic unit breaks down, a red-faced dome light automatically flashes, revolves and winks at the weld inspector. This blushing signal tells him that the unit needs to be checked. It's added insurance that every length of pressure tubing is completely tested before it leaves the plant.

Our inspection techniques are rigid. But they help us develop a high quality product for use in applications such as boilers, heat exchangers, condensers, superheaters, economizers and other types of heat transfer equipment.

USS National Electric Welded Pressure Tubing is available in sizes ½"O.D. to 5½"O.D. inclusive, in walls from .035" to .250", and in lengths up to 44 feet. Consider USS National Electric Welded Tubing for your next installation. It's stocked by National Tube Distributors all over the country. Our trained Mill Service Force is also available for field consultation. Write National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and National are registered trademarks



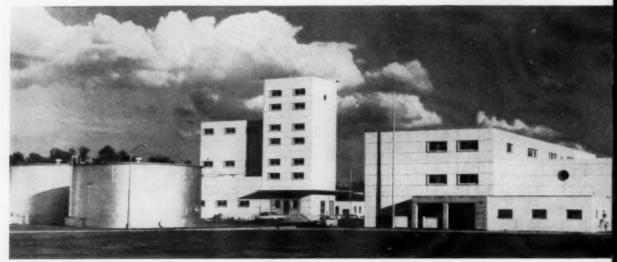
National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors United States Steel Supply Division United States Steel Export Company, New York





H. T. Oberly, Superintendent of the Water Department, St. Petersburg, Florida, shown leaving the Municipal Water Works Building. The efficient, modern Cosme pumping station shown below is one of two serving the growing St. Petersburg area.



"The Westinghouse Inspection Contract is the best maintenance investment the city Water Department ever made"

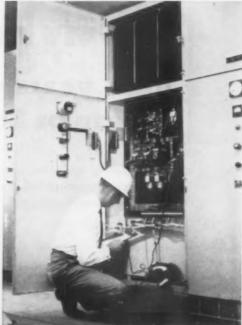
says Mr. H. T. Oberly, Superintendent of Water Works, St. Petersburg, Florida

During initial inspections at the two St. Petersburg Water Works pumping stations, Westinghouse Field Service Engineers discovered two serious problems. Without immediate action, these defects could have caused water shortage emergencies in the city. Insulating oil in a power transformer at one site had a dangerously high acid content . . . needed immediate filtering and retreating. In the second instance, a stand-by generator was found to have a grounded field coil. The unit has always been used in emergencies and during heavy electric storms. It is routine operation to switch to an emergency generator in these instances. It has a weekly hour's run if there have been no power failures.



Mr. Putnam, Supervisor of Washington Terrace station and Roy Love, Westinghouse Field Service Engineer, check the layout of the transmission portion of the pumping station. Power coming into this substation is used to run the pumping equipment.

Westinghouse Field Service Engineer inspects, tests and makes minor adjustments on all the electrical equipment in one of the St. Petersburg pumping stations. Pictured is one of the thorough electrical checks on the control circuits.



The St. Petersburg Municipal Water Works signed up for the Westinghouse Maintenance Inspection Contract a little over a year ago to cover the Washington Terrace and Cosme pumping stations. In addition to exhaustive checks of the electrical system, the Westinghouse Field Service Engineer inspects all the electrical controls and rotating equipment. Mr. H. T. Oberly says it's the best maintenance investment his Water Department ever made.

You can now have a Westinghouse Field Service Engineer check and test all your electrical equipment under contract—weekly, monthly or yearly, depending upon your needs. Behind him he has the complete resources, research, engineering, man power and facilities of Westinghouse. These scheduled inspections, adjustments and recommendations can prevent equipment failure, reduce outages and down time to a minimum. Yet your cost is amazingly low . . . generally, much less than 1 percent of the value of your equipment.

For complete information, call your Westinghouse sales office or write: Westinghouse Electric Corporation, 1299 Northside Drive, N.W., Atlanta 2, Ga. (Available in the Westinghouse Southeast Region only.)

J.95212

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TUNE IN WESTINGHOUSE CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29.



HOT-DIP GALVANIZING by



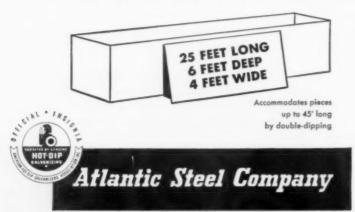
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of this circle to a depth of 12-15". All the coal removed is carefully saved and weighed. The cavity need not have any special shape, but should be cleared of all loose material.

A cellophane or pliofilm sheet is spread in the hole, making sure that edges of the sheet extend well above the top of the ply-board. Water is then poured into the opening until it reaches the bottom edge of the plywood. The quantity of water used is carefully measured. From this latter figure, knowing the water density, the volume of the coal before it was removed can be found.

Where some larger pieces of coal are present, there is always the possibility of the cellophane sheet stretching across a cavity made by the removal of a lump of coal, thus introducing an error. To overcome this we found that dry, fine sand, such as used for locomotive traction, can be used in place of the water and without the use of the cellophane.

Since the sand is dry, it flows readily and is comparatively incompressible. Therefore, its density can be determined separately and used for finding the volume of the hole.

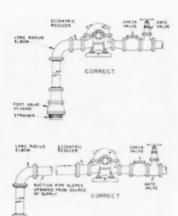
Many of these checks have shown an increased density near the bottom of the pile, but if a carefully considered pattern of sample points is made, we have found the accuracy of density readings to compare favorably with accuracy of the volume survey of the pile.

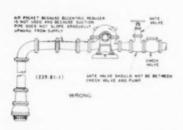
By W. E. SELKINGHAUS, Superintendent, Lumberton Generating Plant, Carolina Power & Light Co.

Air Pockets in Suction Piping

ON PUMP installations involving suction lift, air pockets in the suction line can be a source of trouble.

Suction lines should always pass under other interfering piping, and where reducers are used, eccentric rather than straight reducers





should be used. Sudden changes in velocity or obstructions in the piping can cause air separation from water or other liquids being pumped, due to partial vacuum being created in the suction pipe as well as any small amounts of air which may enter minute leaks in the pipe connections.

If gate valves are used in the suction line, they should be installed with the stems in horizontal position so that no air pockets are formed at the top of the valve near the bonnet. It is also important that there are no elbows close to the suction nozzle of the pump except when the elbow is in a vertical position. A long radius elbow should always be used.

Air pockets in the suction line can cause loss of prime on startup as well as restrict the flow in the suction piping to the extent that a reduction in capacity is experienced. In extreme instances, this could become serious enough to cause cavitation and subsequent damage to the pump. The accompanying illustrations show both the correct and incorrect methods of installing suction piping where the pump is operating on a suction lift application.

Courtesy Goulds Pumps, Inc.



53 FRICK REFRIGERATING AND AIR CONDITIONING UNITS SERVE ST. LOUIS MEDICAL CENTER

Frick Equipment Used Exclusively
For Original Equipment
Plus 37 Additional Orders

 The Barnes Hospital-Washington University Medical Center in St. Louis is a good example of the dependability and versatility of Frick refrigeration and air conditioning equipment. Since 1944, when the first unit of Frick equipment was installed, 37 repeat orders have raised the number of Frick units to 53.

Today, 13 "ECLIPSE" compressors, 29 low pressure units, and 11 unit air conditioners are in service.

The medical center facilities themselves have expanded to include eight hospitals with nearly a thousand beds, schools of nursing, dentistry, and occupational therapy . . . clinics, laboratories, lecture rooms, and libraries.

All of the air conditioned operating rooms are provided with 100% fresh air which is filtered electrically. The main kitchens, cafeteria and dining rooms are all air conditioned with Frick equipment. All cooler and freezer units are automatically defrosted. Some units maintain temperatures from 0° to 100° F., with varying humidity control.

In some special research projects, dual refrigeration equipment with indicating red lights has been installed.

If your interest is industrial or institutional refrigeration or air conditioning, a Frick engineer will be happy to discuss it with you at no obligation.

FRICK COMPANY Waynesboro, Pennsylvania



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Corrosion Protection

A METHOD of corrosion protection

known as Quelcor, consists of preheating the metal part to be coated and then dipping it into a PVC resin dispersion. The heat stored in the metal coagulates the resin, thus forming a continuous homogeneous and seamless coating around the entire part.

The process is being used extensively for the coating of steel exposed to corrosive gases and liquids, such as fans, ductwork, floor grating, screens, pumps, structural members and any other items to be protected from chemical attack. In many cases it has eliminated the need for expensive nickel alloys and has made the use of plain steel and cast iron possible.

In one Southern chemical plant, floor grating had to be replaced every three to four months for safety reasons, as the metal would completely corrode away. Quelcor coated grating has been in operation in this plant for four years now with no signs of failure.

In another plant rubber lined ventilating fans would have a limited life as the corrosive gas handled would enter the seams and attack the steel underneath. The completely seamless coating eliminated this problem.

Power plants using salt water for condenser cooling and employing cathodic protection in screen wells, condensers and heat exchangers, are having the anode racks and clamps Quelcor coated. In addition to corrosion protection, the high dielectric strength of the material and its freedom of pin holes provides excellent insulation against shorts.

Sewage disposal plants are using Quelcor coatings for the grating over collecting wells, Parschall flumes and other locations where corrosion presents a problem.

These applications were made by Quelcor of Florida at Bartow, Fla.

Prime Tank Aids Centrifugal Pump

THE CONVENTIONAL centrifugal pump is built to handle ordinary liquids with top efficiency. However, any undue thickening of the liquid handled will cause trouble in large quantities.

Pressed for equipment to dewater a plant basement while awaiting service from the overworked fire department, we put an 8 hp belt-driven centrifugal pump into use to gain entry to certain critical sections as early as possible, ahead of the large municipal equipment arrival.

The initial several feet of water was pumped readily enough; but as the slimes formed by mud, sand and silt were encountered, the pump choked up when being started after a shift from one pumping position to another in the basement. Dropping the suction hose into the water level above the muck got it started readily enough, but for those occasions where this was no longer possible we developed a prime tank.

With this arrangement a garden hose supplied start-up water to the prime tank to develop sufficient pump vacuum in the suction to begin lifting slimes consisting of 50 per cent solids swept in by the rampaging flood waters. Once started, the pump handled the material satisfactorily and was kept in prime by stirring up the muck to develop maximum fluidity at all times. Of course it was also necessary to see that the suction hose strainer was kept cleared of debris and properly submerged to exclude air.

> By PAUL C. ZIEMKE Clinton, Tennessee

BUELL CAME UP FAST ON THE OUTSIDE!

In fly ash collection the specification of electric precipitators is...increasingly... "Buell". The 1959 central station design survey published by POWER magazine in October, 1959 shows that Buell installed 8 out of 22 precipitators. And that high proportion was not surpassed even by the longest-established manufacturer in the field!

Why this fast-growing demand for <u>Buell</u> electric precipitators? There are many reasons. Unique design features minimize maintenance and provide exceptionally high efficiencies. In 10 years of selling Buell SF Electric Precipitators, the number of spare and replacement parts ordered from Buell has amounted to less than 2% of the total sales! You seldom replace Buell's exclusive 'Spiralectrodes,' because the rigid fastening makes sure they won't break. Their precise construction of strong-heavy stainless steel prevents rust and

corrosion. See for yourself some of the reasons why men in many industries are specifying Buell SF Electric Precipitators. Send now for details. The Buell Engineering Company, Inc., Dept. 80-F, 123 William St., New York 38, N.Y. Northern Blower Division, 6404 Barberton Ave., Cleveland, Ohio. (Subsidiary: Ambuco Ltd., London, England.)





NEW Catalogs & Bulletins

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MAINTENANCE-TOOLS EQUIPMENT & METHODS

3—Metallizing — Use industry's low cost "putting-on" tool. Now within reach of the smallest shop. Bulletin tells you how you can spray carbon steels, stainless, babbitts, brass, nickel, aluminum, etc.—MET-ALLIZING ENGINEERING CO., INC.

6—Tool Truck — Save time with this compact truck carrying full tool selection to emergency repair jobs. Four drawer unit described in literature 8141-A. Semi-pneumatic 10" balloon tires ease heavy loads over rough pavements. — SNAP-ON TOOLS CORPORATION.

8—Ceramic Coatings — Chempro sprayed ceramic coatings to resist abrasion, erosion and corrosion described in Bulletin CP-28. Ideal for shaft, shaft sleeves, impellers, valves, cams, etc. — CHEMICAL & POWER PRODUCTS, INC.

22—Lubricator Alert — Data sheet describes lubricator flow switch that indicates positive flow at terminal points on any force feed lubricator system. Easily installed on any existing application. Indicates lack of flow to the point of injection. — MANZEL.

24—Roof Maintenance — 4 page Catalog 5D describes Dri-N-Tite products for patching, priming and coating composition, corrugated or sheet metal, slag, gravel, concrete and felt roofs. — A. C. HORN COMPANIES.

32—Scale Removal — Data sheet on Kwik-Kleen, a completely safe method of rapid scale removal for heat transfer surfaces. — THE NORTH AMERICAN MOGUL PRODUCTS COMPANY.

33—Air Compressor Rod Packing— Catalog 56 shows how "Compressor" No. 760 stays flexible under intense dry heat and protects rods from premature wear. — THE BEL-MONT PACKING & RUBBER CO.

35—Stop Corrosion — 4 page bulletin tells you how Alkasteem neutralizes carbon dioxide and Ox-Gem reacts with oxygen to stop corrosion in boilers, heaters, con-

densate returns, steam lines, traps, etc. — ANDERSON CHEMICAL COMPANY, INC.

37—Maintenance Gun — Brochure describes the Von Arx Air Gun — lightweight tool for tough cleaning, de-scaling and de-rusting jobs. Air-operated reciprocating needles adjust to contours automatically. Three sizes. Comes in handy kit with accessories. — MARINDUS COMPANY.

38—Heavy-Duty Wrench Set—Literature 8141-C details the Loxocket 521-EHD-B. Metal case containing 17 sockets from 1 7/16" to 3\%", ratchet, sliding bar and two extensions — 8" and 16" — ready to go on any assignment. — SNAPON TOOLS CORPORATION.

53—Steam Line Treatment — Folder describes alkaline IPCO S-L-T. Used in boiler water, it will volatilize and travel with steam to return lines. Prevents costly repairs and provides insurance against replacing pipe and fittings. — IPCO LABORATORIES, INC.

71—Fibre Roof Coating — Folder covers "The easy and low cost way to repair and renew roofs." — GARDNER ASPHALT PRODUCTS CO.

FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

123—Slurry Pump — Catalog describes the new SP-90 slurry pump which permits proportion of slurries in the mix tank to remain constant, with pumping rates variable from maximum to 1/5 of maximum.—MANZEL.

132—Glassed Centrifugal Pumps
12 page Bulletin 725.2 describes
line of glassed pumps for handling
corrosive acids and alkalies. Every
part of pump exposed to liquid has
a tough glass surface. Specification,
ratings, dimensions. — GOULDS
PUMPS, INC.

146—Vertical Sump & Process Pumps
—12 page Bulletin 726.2 describes new line of heavy duty vertical centrifugal pumps for wet and dry pits to 20 ft. Single and duplex units. Capacities to 1080 gpm. For regular sump service or wide variety process applications. — GOULDS PUMPS, INC.

Bulletin 122 describes and illustrates the type BFI high pressure pumps. Design features, service ratings and engineering data included.

— PACIFIC PUMPS, INC.

169—Airfoil Fans — Bulletin 179 covers complete line of Airfoil mechanical draft fans for forced and induced draft featuring wide range of pressure-volume ratios, high efficiency, low noise level, rugged construction. — GREEN FUEL ECONOMIZER CO.

172—Pressure Fans — For 10" to 50" SP and capacities 200 to 13,000 cfm. Dimensions and capacity tables included in 20 page Catalog 857. — CLARAGE FAN CO.

INSTRUMENTS-METERS CONTROLS-REGULATORS

207—Control Centers & Systems
Combustion safeguard & automation packaged control centers insure full co-ordination of complete system, place responsibility on one source, insure correct wiring, and reduce field labor. Catalog C11 illustrates variety of designs and circuits now in use. — WEBSTER ENGINEERING.

231—Control Valves — Catalog No. 305 illustrates and describes construction and specifications for a wide line of air operated diaphragm control valves suitable for the majority of general process applications and plant services. — MASON-NEI-LAN.

238—Auxiliary Alarm on Remote Gages — Bulletin C6 — EyeHye Remote Reading Gage with electrode and relay adaptation actuates auxiliary audible or visible signals at high or low water levels. — RELIANCE GAUGE COLUMN CO.

241—Liquid Level Controllers—Catalog No. 405 illustrates and includes technical, instructive and descriptive information on the 12,000 Series variable-displacement type controllers. — MASON-NEILAN.

243—Multi-Pointer Indicator — 4 page Product Specification P11-1 illustrates group of individual miniature vertical gage units. Gives details of pointer movement, 3½ in.

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Bulletins (Cont.)

scale design, and optional internal illumination. — BAILEY METER CO.

256—Boiler Control — On-the-job report of Carolina Power and Light Company's Louis V. Sutton plant in Bulletin 1032. Features: combustion, feedwater, boiler feed pump re-circulation controls plus automatic sequential soot blowing.— COPES-VULCAN DIVISION.

287—Color-Port Water Gage—Bulletin WG-1814 describes the new gage for high pressure boilers (up to 3300 psi). Gives full details on design and operation and shows how it gives greater visibility and greatly reduced maintenance requirements.

—YARNALL-WARING COMPANY.

PLANT CONSTRUCTION—WELDING EQUIPMENT—SPECIALTIES

306—Steel Buildings — Shed roof, gable roof frameless and gable roof rigid frame units described in Catalog SX-13757. 5,000 sizes available to meet all space needs. — ARMCO DRAINAGE & METAL PRODUCTS, INC.

317—Drier Compressed Air—Bulletin 130 shows how Aero After Cooler cools compressed air or gas below temperature of surrounding atmosphere; no further condensation in your air lines. Installed outdoors. Saves cooling water. Gives better operation of air-operated tools, etc.—NIAGARA BLOWER COMPANY.

318—Wrought Iron — "ABC's of Wrought Iron"—A concise digest of more detailed technical handbook material on wrought iron—describes resistance to corrosion, fabrication process—where needed—shock and vibration endurance.—A. M. BYERS.

323—Mercury Vapor Fixture — Industrial color corrected units described in Bulletin 401. "Stabilux Socket" secures bulb end of lamp, eliminating lamp rupture and breakage from vibration. — WIDE-LITE CORP.

explains general operating characteristics of centrifugal and gravitational type classifiers. Curves illustrate high efficiencies achieved in actual installations and indicate particle size distribution of incoming feed, separated fines and coarse material. — BUELL ENGINEERING CO., INC.

363—Magnetic Separators — Catalog 910 covers wet concentration and magnetic recovery. Various types and sizes shown as well as typical installations and machines. — JEF-FREY MFG. CO.

365—Storage Water Heaters — Gas fired, scale free 230 units described in Bulletin 4. Fully automatic package requires only simple connections. Available in more than 100 storage and recovery combinations. Storage capacities range from 250-4,000 gal. — THE PATTERSON-KELLEY CO.

386—Rigid Frame Buildings—8 page bulletin "Dixisteel Rigid Frame Buildings" — low cost, flexibility of design, durability, and minimum maintenance; also triangular or bowstring truss all-steel roof systems; fabricated for rapid erection. — ATLANTIC STEEL COMPANY.

PIPING—VALVES—FITTINGS STEAM SPECIALTIES—TRAPS

401—Steam Traps — Bulletin 775 gives price, dimension and capacity data on Open Float and Thermostatic Steam Traps for troublefree heating service.—ARMSTRONG MACHINE WORKS.

Purpose Valves, Supplement No. 1 to Catalog F-9, covers gate, globe and angle valves, ½" through 2" sizes, for 150-800 pound service. Featuring 13% chrome stainless steel trim with hard facings. —HENRY VOGT MACHINE CO.

403—Valve Operators—Folder shows how re-designed sprocket rim makes any valve readily accessible from the floor. Simplifies pipe layouts, prevents accidents, fits all valve wheels. — BABBITT STEAM SPE-CIALTY CO.

407—Piping Materials—Bulletin reports on intensive investigation into problem of main steam piping materials and gives data on stress rupture characteristics of Types 316 and 347 stainless steel piping adjacent to welded joints. — PITTS-BURGH PIPING AND EQUIPMENT COMPANY.

410—Flexible Connectors — How all-metal connectors absorb pip-ing vibration described in Catalog 1D-100C. Convey corrosives, simplify misaligned hookups, and save installational time. Bronze, carbon steel and stainless steel. — UNIVERSAL METAL HOSE CO.

415—Steam Trap — Bulletin No.
455-B describes the Float-Thermostatic steam trap with its entire operating element in one unit making it removable without disturbing inlet and outlet connection to the semi-steel trap body, suitable for 125 psf steam pressure. — SARCO COMPANY, INC.

420—Valves — 24 pages Catalog illustrates and describes bronze, iron, steel and corrosion-resistant valves for controlling the flow of water, oil, gas, steam and corrosive fluids. — THE WM. POWELL CO.

452—Pipe and Tubes—42 page Bulletin 26 gives types of steel tubes, tensile, creep and rupture properties, welding and forming data, applications and other valuable data.

National Tube Div., UNITED STATES STEEL CORP.

479—Multiport Drainers — Publication 5201 containing 8 pages describes units for removing large quantities of condensate under vacuum or pressures, as from evaporators, heaters, separators, coils, or steam lines (up to 200 psi maximum). Lists discharge capacities, shows features and typical installations. — COCHRANE CORPORATION.

493—Unions & Valves — Complete company line of pipe unions and check valves covered in Catalog 56. New Four-Star lug nut unions and spring controlled check valves included. CATAWISSA VALVE & FITTINGS COMPANY.

BOILERS—STOKERS TURBINES—BURNERS

502—Feedwater Treatment — 4 page catalog tells how Braxon and Flako internally condition water so as to remove and prevent scale formation and corrosion in boilers. — ANDERSON CHEMICAL COMPANY

521—Gas Tempering — How you can burn the most economical fuel available (coal, oil or gas) described in Bul. G-96, Cuts overall plant costs since smaller size unit requires smaller building per kw, etc. — THE BABCOCK & WILCOX CO.

526—2-Pass Automatic Boilers

Bulletin tells how Continental packaged boiler design cuts down on inspection and maintenance costs and keeps down time to a minimum.

BOILER ENGINEERING & SUP-PLY CO.

527—Pneumatic Spreader Stoker — Bulletin shows how unit combines coal drying, metering, conveying, uniform burning and cinder return in one efficient system. — IRON FIREMAN MFG. CO.

532—Economical Steam — Forced draft, pressurized gas or oil fired units described in SB-59 catalog. Two-drum water tube units include steam trim, draft equipment, burner and combustion safety controls. — ERIE CITY IRON WORKS.

Bulletins (Cont.)

533—Wall Deslagger — Design and operational features of furnace wall deslaggers discussed in Bulle-tin 1034.—COPES-VULCAN DIVI-SION

536—Complete Water Treatment Folder containing data on elimination and prevention of scale, sludge, corrosion, algae and impure steam in feedwater-steam systems systems - IPCO LABO-RATORIES, INC.

539-Industrial Burners keep heating costs low with Hev-E-Oil commercial-industrial burners described in literature SPI-859. Models from 5 to 150 gph; 859. Models from 5 to 150 gph; automatic, electronic controls; Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 Btu. — INDUS-TRIAL COMBUSTION, INC.

550-Coal Crushers - Catalog 784-C describes single and double roll crushers, swing hammer pulverizers for all sizes of plants.—JEFFREY MANUFACTURING COMPANY.

For more Free Data FILL IN CODE NO. on the Handy Return Card - Page 77

551-Packaged Water Tube Boilers Complete data and dimen- Complete data and difference of the control of INDUSTRIES. INC

553—Boiler Start-Up — Bulletin 1048 describes a moving tem-perature probe which patrols critical boiler gas passages and gives ade-quate warning of incipient hot spots during lighting off. Includes struc-tural details and specifications of probe as well as explanations of the operating features and methods of control. — COPES-VULCAN DIVI-

555—Package Air Preheater — 14 page booklet tells how you can install this package unit at fraction of expense required for conventionheat recovery equipment. Fast and easy installation offering long term fuel savings. — THE AIR PRE-HEATER CORP.

557—Coal — Current brochure on "Prescription Coals." — A. T. MASSEY COAL CO., INC.

574—Packaged Generator—Bulletin 582 describes Vapormatic Coil-N-Shell Steam Generator for service

requirements of 5 to 150 psig. Gives operation features and specification data. Available with gas, oil, and combination gas/oil fuel systems. — TEXSTEAM CORP.

ENGINES-DRIVES POWER TRANSMISSION MATERIAL HANDLING

600-Mechanical Shaft Seals-Chempro mechanical external seal described in Bulletin CP-551. First seal designed for complete inter-changeability with packing. No mounting clamps, machinery stuff-ing box faces or drilling holes. In-stall in 30 min. Adjust after installa-tion. — CHEMICAL & POWER PRODUCTS, INC.

601-Belt Conveyors -Basic engineering data on feeders, idlers, pillow blocks, pulleys, scrapers, take-ups and trippers featured in Engineering Data Book ID-591. — CONTINENTAL CONVEYOR & EQUIPMENT CO.

606—Retaining Ring Kits 4 Truarc cadmium plated rings 84 sizes in one economy kit. Sizes from ¼ to 2½ in. in three most used series of internal, external and universal crescent ring designs — \$34.50 per kit. — DIXIE BEARINGS, INC.



A. C. HORN UPER-BONDSIT For long-lasting patches on concrete surfaces

The new liquid latex emulsion that bonds concrete and mortar mixes tightly and lastingly to most seasoned concrete surfaces without having to roughen them. This self-curing bond will adhere to eroded, cracked or irregular surfaces and also will absorb heavy impact without chipping or dusting, providing a finished surface that is slipresistant.

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614—Vertical Transportation — Elevator Catalog — Describes and illustrates details of passenger and freight elevators, escalators, dumbwaiters, and modernization and maintenance equipment for use in industrial, utility and service plants. —OTIS ELEVATOR CO.

638—Idlers — Bulletin 925 details the Permaseal Idler's development from laboratory to installation, Outlines Double Flexible Diaphragm Seal which keeps grease in and dirt out. — JEFFREY MANUFACTUR-ING CO.

651—Bearing Aluminum Bars—Aluminum bearings can replace bearings of other metals which cost twice as much. No sacrifice in performance or life. Catalog 46 covers composition, machining and use. — THE BUNTING BRASS AND BRONZE COMPANY.

WATER TREATMENT—HEATING & AIR CONDITIONING—DUST & FUME CONTROL—REFRIGERATION

701—Peak Load Problems? — Keep your air conditioning and refrigeration systems operating at maximum efficiency during coming peak load months. Catalog tells how Anco treatment removes rust and scale and kills slime and algae in your equipment. — ANDERSON CHEMI-CAL COMPANY.

702—Water Conditioning — Bulletin 611C, 20 pages, describes manual and automatic softeners, zeolites and ion exchange resins, mixed-bed and multi-column deionizers, dealkalizers, ion exchange systems, filters and purifiers, and water treating chemicals. — ELGIN SOFTENER CORPORATION.

715—Amine Treatment — Return line corrosion is a critical problem in maintaining economical, efficient power plant operation. Bulletin CP-100 shows how amine treatment is an easy, effective and economical way to eliminate pipe corrosion problems. — THE BIRD ARCHER COMPANY.

717—Complete Water Treatment —
Folder containing data on elimination and prevention of scale, sludge, corrosion, algae and impure steam in air-conditioning systems, feedwater-steam and brine systems — IPCO LABORATORIES, INC.

718—Zeolite Softeners — 20 page catalog 4520 describes the sodium zeolite softening process in detail. Contains data required for proposals, lists factors important in selection of proper zeolite material

(Continued on page 82)

How ACCURATE



can an oil drop get?

Precise and punctual is the best way to describe an oil drop metered by a Manzel force-feed lubricator. Model "82", for example, will deliver an exact amount of oil exactly where it belongs at exactly the right point in the cycle of your mechanism. The positive sight feed shows you the oil on its way to work *after* it's passed through the pump. Our Model "82" is built for pressures up to 6000 PSI

and "round the clock service"! For details on "82" or any of our complete line of lubricators, write for our catalog. Manzel, 257 Babcock Street, Buffalo 10, New York. To lubricate with mathematical precision, just





Bulletins (Cont.)

and in sizing of equipment. Single valve controls all cycles of service and regeneration. — COCHRANE CORPORATION.

719—No Frost Refrigeration — Bulletin 105 describes with diagrams and photographs methods used for food freezing, chilling and warehouse refrigeration on largest scale without frost or ice formation, insuring always full capacity and uniform temperature. — NIAGARA BLOWER CO.

734—Dust Collector — 8 page bulletin describes dust collection system for collecting nearly 5 tons of dust per hour. Includes 1st and 2nd stage collectors — 48 cyclones and 2 twin-section electric precipitators. Well illustrated. — BUELL ENGINEERING CO., INC.

748—Stop Fungal Decay — Bulletin MT-58 describes company's preservative wood treatment for cooling towers, pinpoints organisms that destroy effective performance and prescribes treatment that arrests these destructive organisms, as well as the application techniques. — THE MARLEY COMPANY.

764—Cooling Equipment — Bulletin 80-D describes company's complete line of commercial and industrial equipment—operating principles, design features, etc.—FRICK CO.

771—Water Treatment — 4 page brochure points out company's 8-point water treatment coverage for elimination of scale, sludge, corsosion and impure steam. — IPCO LABORATORIES, INC.

ELECTRICAL

801—Motors—Bulletin describes and catalogs more popular a-c motors from 1 to 60 hp for every process and manufacturing requirement. Single phase and polyphase; surpass NEMA specifications.—BROOK MOTOR COMPANY.

807—Motor Bearings — Catalog 258 gives complete listing of cast bronze motor bearings for all makes and sizes. — THE BUNTING BRASS AND BRONZE COMPANY.

816—High Voltage Protection — 36 page catalog of linemen's protective equipment describes products for utility and industrial electrical fields. — CHARLESTON RUBBER COMPANY. 820—Electrical Maintenance — New contract service (for Southeast only) inspects and tests motors, generators, gearing, control and distribution systems, at a cost less than 1% of value of equipment, — Atlanta office of WESTINGHOUSE ELECTRIC.

855—Wiring Analyzer — 4 page bulletin describes Model 301 Adequate Wiring Analyzer which quickly, simply and easily tests wiring without confusing calculators or slide rules.—SPRAGUE ELECTRIC COMPANY.

871—Electrical Protection — Handbook tells how to select protective devices for circuits, motors and apparatus. Condenses all '59 Code references covering protection problems. Explains how installation costs can be cut and space saved with Dual-Element fuses. — BUSSMANN MFG. DIV.

874—High Voltage Rubber Cables
— 32 page catalog contains information on design features, insulations available, and performance
highlights of company's butyl rubber power cable, Durasheath. Also
data on kinds of available constructions from from 600 v to 15,000 v
conductors. — ANACONDA WIRE
& CABLE CO.



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Late Bulletins

F-1—Automatic Boilers — Catalog No. 120, 12 pages, describes fully automatic, horizontal Scotch Marine type boilers. Gives specifications for gas-fired and oil-fired boilers from 10 to 100 hp for 100 to 125 lb maximum working pressure. — LOOKOUT BOILER & MANUFAC-TURING CO., Chattanooga 5, Tenn.

F-2—Gear Motors — Bulletin No. 198, 8 pages, covers Slo-Speed Gear Motors and Slo-Speed Separate Motor Reducers, basic types and modifications. — STERLING ELECTRIC MOTORS, INC., 5401 Telegraph Road, Los Angeles 22, Calif.

F-3—Dust Control — Bulletin 805, 28 pages, catalogs dust control equipment including multi-bag, filters, glass-bag filters, whirl-clones, special collectors, and accessories. — DRACCO DIVISION OF FULLER CO., Harvard Ave. & E. 116th St., Cleveland 5, Ohio.

F-4—Packaged Boilers — Bulletin, 4 pages, describes and illustrates Powermaster Model 5 packaged automatic boilers, including high and low pressure types in 20 hp to 100 hp sizes, fired by oil, gas and combination gas-oil. — ORR & SEM-BOWER, INC., Reading, Pa.

F-5—Flame Spray Processes — Bulletin 136B 30M, 10 pages, provides engineering data on coatings of metals, ceramics, carbides and other high melting point materials. Illustrates typical applications. — METALLIZING ENGINEERING CO., INC., Westbury, Long Island, N. Y.

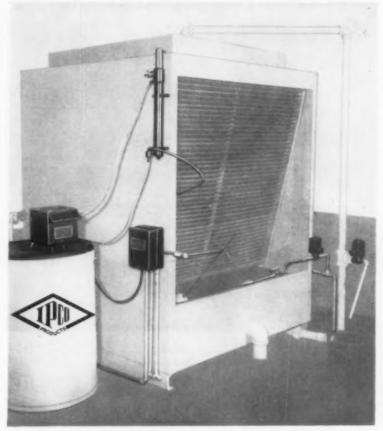
F-6—Fire-Retardant Paint — Bulletin No. 100, 12 pages, explains how fire retardant paint works and how it is applied in industrial buildings to reduce fire hazards. — ALBI MANUFACTURING CO., INC., Rockville, Conn.

F-7—Low Voltage Equipment—"Buy Log" (GEC-1100B), 84 pages, covers low voltage distribution equipment. Application, selection, pricing and ordering information can be found quickly and easily.—GENERAL ELECTRIC COMPANY, Distribution Unit, Plainville, Conn.

F-8—Valves — Catalog 10-A, 16 pages, is a revised edition presenting operating specifications, characteristics, sizes, and ratings of the company's gate valves; globe and angle valves; check valves; and related equipment. — AMERICAN CHAIN & CABLE CO., INC., R-P&C Valve Division, Reading, Pa.

F-9—Safety Cable — Catalog, 16 pages, features safety mineral insulated cable for various industrial uses, including hazardous areas and instrumentation. Illustrated with applicational photographs. — GENERAL CABLE CORP., 730 Third Ave., New York 17, N. Y.

(Continued on page 84)



Treat Cooling Systems Automatically



Eliminate costly non-automatic methods with the IPCO Hydrotrol. The amazing Hydrotrol controls fresh water feed, bleed-off, and chemical treatment in direct proportion to water evaporation, all automatically. The Hydrotrol is not affected by variations in weather conditions. Savings in water, chemicals, maintenance and man hours will pay for the Hydrotrol.

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F-11—Precision Ground Gears—"An Advanced Concept in Modern Gears," 12 pages, describes advantages in using hardened and precision ground gears. Methods, facilities and applications are illustrated.— PHILADELPHIA GEAR CORP. Schuylkill Expressway. King of Prussia (Sub. Phila.), Pa.

F-12—Control Valves — Catalog No. 407, 24 pages — Describes line of electric motor operators and motorized valves. Charts and photographs cover construction and design, specifications, and ordering information. — SCHADE VALVE MFG. CO., 2527 N. Bodine St., Philadelphia 33, Pa.

F-13—Wall Deslagger — Bulletin 1066, 4 pages, illustrates and describes Vulcan RW-3A wall deslagger with dual air drive for cleaning of boiler, superheater, and reheat-section walls. — COPES-VULCAN DIVISION, BLAW-KNOX CO., 939 W. 26th St., Erie 4, Pa.

F-14—Heat Exchanger & Condenser Tubes—Technical Bulletin ASTM A-382, 10 pages, lists installations and compares service of wrought iron to that of other metals used as tubing in the same equipment. Section is devoted to sizes of cold drawn wrought iron tubing, calculated weight, working pressures and O.D. tolerances. — A. M. BYERS COMPANY, Pittsburgh 22, Pa.

F-15—Anti-Rust Paint — Bulletin RAR-2, 1 page, gives price list and features of Rustrem anti-rust paint designed to provide complete coverage in one coat without use of a primer, for all metal applications, indoors or out. —SPECO, INC., 7308 Associate Ave., Cleveland 9, Ohio.

F-16—Woodworkers' Vises — Bulletin LL-8216, 2 pages, contains specifications and illustrations of 18 woodworkers' vises, featuring 3-point mounting with two slotted brackets and a center rest, to reduce installation time and assure firm fastening, easy operation and longer life. — THE COLUMBIAN VISE & MFG. CO., Cleveland 4, Ohio.

F-17—Truck Mounted Compressors
—Form E-273, 4 pages, describes units driven directly from truck engines through heavy-duty power take-offs to eliminate need for separate compressor engines. Illustrated with photographs, specifications, and installation drawings. — DAVEY COMPRESSOR CO., Kent, Ohio.



Is there an all-purpose steam trap to meet all requirements? There is no existing single purpose trap to answer all trapping problems. Instead, Anderson offers four different trap designs, each engineered for a definite type of application.

For your general purpose applications, the answer is Super-Silvertop Steam Traps. Where fast heating-up is required, Anderson Heat-Kwik Combination Open Float or Thermostatic Traps are without an equal. Ideal for outdoor, freeze-proof installations, insist on our Quik-Flex Thermostatic Steam Traps. For draining condensate from steam or moisture from air and gas equipment, Anderson continuous flow type Float Traps are unbeatable.

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F-18 — Ten Engine Maintenance
Steps — Booklet, 24 pages, tells
power users how to increase equipment availability, reduce operating
costs and obtain better engine performance, with a chapter covering
each of the ten steps. — CUMMINS
ENGINE COMPANY, INC., Sales
Services Dept., Columbus, Indiana.

F-19 — Maintenance for Doors — Manual, 16 pages, is prepared for maintenance men in plants having rolling steel doors, with data for ordering replacement parts, typical door construction features, inspection periods, door adjustments, and other maintenance procedures. — THE R. C. MAHON CO., Rolling Steel Door Div., East 8-Mile Road, Detroit, Mich.

F-20—Welding Supplies — Catalog EW-211, 16 pages, gives information on line of arc welding accessories and supplies including headshields, goggles, cleaning tools, electrode holders, cable connectors, protective clothing, and related equipment. — HOBART BROTHERS CO., Troy, Ohio.

F-21—Power Transmission & Conveyors — Catalog No. 759, 106 pages, illustrates and describes roller chain, stock sprockets, conveyor chain, flexible couplings, and all items in the company's line of power transmission and conveyor products. Includes specifications and prices.—DIAMOND CHAIN COMPANY, INC., Indianapolis 7, Ind.

F-22—Circuit Breakers—1960 Speedfax Catalog, 60 pages, provides information on molded case circuit breakers; individually-enclosed lowvoltage power circuit breakers; and engineered products. Selection charts list types, ratings, and accessories. Illustrated with photographs.—I-T-E CIRCUIT BREAKER COMPANY, 1900 Hamilton St., Philadelphia 30, Pa.

F-23—Large Steam Turbines — Bulletin 03B9448, 40 pages, describes advance design and construction features of large steam turbine generating units, along with typical ratings and arrangements of the very large-capability machines available. Illustrated with drawings and photographs. — ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wisc.

F-24—Electrical Insulation — Publication GET-2929A, 12 pages, describes and illustrates the characteristics and applications of complete line of insulating materials for electrical equipment including mica mat, built-up mica, coated materials, varnishes, paints, adhesives, compounds, and others. Suggests uses and gives ordering information. — GENERAL ELECTRIC COMPANY, Schenectady 5, N. Y.

F-25—Boiler Control—Bulletin 1065, 12 pages, describes boiler control on an all-outdoors, 850 psig, 900 F unit at a municipal lighting plant. Schematic diagram shows sys-



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A new Anchor Fence really makes a difference! We have Anchor at all four of our New England branches. Customers' increased confidence in the security of our warehouse facilities is helping business. The neat appearance of the fence spruces up the property and attracts customers. We are able to store materials outside safely—a real saving. There has been a definite increase in safety, too. We can control traffic in and out of the plant as well as establish traffic lanes at the property.

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tem engineered for the 145,000 lb/hr boiler fired with Bunker C oil and having provision for future use of pulverized coal or natural gas. — COPES-VULCAN DIVISION, BLAW-KNOX COMPANY, 939 W. 26th St., Erie 4, Pa.

F-26—Stationary Compressor—Bulletin, 24 pages, describes the WN-114 stationary compressor. Includes specifications on three basic models of the semi-radially structed units ranging from 1385 cfm to 1948 cfm at 125 psi. Package de-sign, components, intercooling, lubrication, and accessories are covered. — JOY MANUFACTURING CO., Henry W. Oliver Bldg., Pittsburgh

F-27—Process Heating — Bulletin 102.2,4 pages, is prepared to help solve process heating problems. Describes how electric liquid heat transfer units for jacketed equipment can be used to advantage. Photographs show application of packaged heating units in plants. packaged heating units in plants — HYNES ELECTRIC HEATING CO., P. O. Box 1004, Mountainside, N. J.

F-28—Magnetic Pulleys — Bulletin B-50-1A, 6 pages, describes line of Erium powered permanent magnetic pulleys incorporating two designs and a variety of sizes. Suggests

uses in removing tramp iron; removing small iron contamination; preventing machinery damage as well as fires and explosions.—ERIEZ MANUFACTURING CO., Erie 6, Pa.

F-29—Vibrating Feeders—Book 2869, 12 pages, covers motorized counterweight vibrating feeders in more than 60 sizes. Illustrates both single and twin motor types in either floor mounted or cable suspended models, designed to feed a wide range of bulk materials at a uniform rate from bins, hoppers, storage piles or conveyors. — LINK-BELT COMconveyors. — LINK-BELT COM-PANY, Dept. PR, Prudential Plaza, Chicago 1, Ill.

F-30—Fittings and Flanges — Technical Bulletin FDC-275, 4 pages, is one of a series of 24 data folders cataloging B&W welding fittings and cataloging Box w wedning to covers 36" forged steel flanges. It covers 36" nominal pipe sizes. — THE BAB-COCK & WILCOX COMPANY, Tubular Products Division, Welding bular Products Division, Welding Fittings Dept., Milwaukee 46, Wisc.

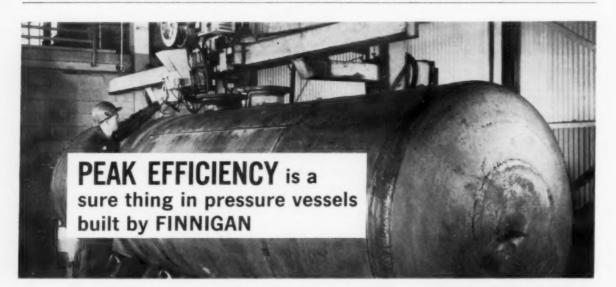
F-31—Packings — Catalog FF-1059, 8 pages, offers information on 14 types of Palmetto fabric, foil, plastic and filament packings, available in nine constructions. Illustrations, prices, and ordering instructions are included. General data lists details on composition, application, service, temperature limits (up to 1200 F) for each type of packing. — GREENE, TWEED & CO., North Wales, Pa.

F-32—Feedwater Heaters — Bulletin YHT 102, 16 pages, presents features of feedwater heaters, with several installation pictures. Describes design details including Multiple and the proper allow tubes. tilok closure, copper alloy tubes welded into steel tube sheets, all-welded shell — an all-welded heater to meet requirements of steam-electric power industry. — YUBA CON-SOLIDATED INDUSTRIES, INC., Heat Transfer Division, 4th & Main Sts., Honesdale, Pa.

F-33-Tube Fittings - Catalog No. F-33—Tube Fittings — Catalog No. 3108, 44 pages, contains technical data on Hi-Seal butt-joint fitting line as well as Braze-Seal fittings for extra high pressure and temperature. Covers both capabilities and limitations, and gives specifications. — THE IMPERIAL BRASS MFG. CO., 6300 W. Howard St., Chicago 48, III. 48, Ill.

F-34-Flexible Couplings - Bulletin No. 5103, 10 pages, gives revised information on complete line of Sure-Flex flexible couplings, including the new "Junior" couplings and the large size bushed couplings. New engineering data is given on other couplings offered by the company.—
T. B. WOOD'S SONS CO., Chambersburg, Pa.

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Finnigan Hot Water Generators are engineered to give you large quantities of hot water for low operating cost. The finest materials, creative skill and quality construction assure efficiency in Finnigan equipment. These generators are fabricated from corrosive-resistant materials and contain copper removable-coil heating elements. Before leaving the plant, each generator must conform to ASME, API, U. S. Government and other specifications, "Fabricated by Finnigan" is your assurance of quality.

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TANKS, SMOKESTACKS, PIPING, WATER HEATERS, BREECHING, PLATE WORK.

Southern News Briefs

(Continued from page 22)



Joel R. Shattles



A. T. Giles

Fairbanks Company Southern Representatives

The Fairbanks Company, Rome, Georgia, announces the following changes in sales assignments in the Southern Branch Sales Territory:

Joel R. Shattles has been transferred from the Virginia-Eastern North Carolina Sales Territory to the Florida-Southern Georgia Sales Territory; A. T. Giles has been assigned to take Mr. Shattles' place in Virginia-Eastern North Carolina.

Emhart Mfg. Co.-Fla.

Voyce-Legier, Inc., of Miami, Fla. has been appointed sales representative by Emhart Manufacturing Company's Maxim Division, Hartford, Conn.

Voyce-Legier will handle the Maxim line of industrial, commercial marine and aviation silencers in Florida. The company will also handle aviation silencers in Georgia and Alabama.

The officers of the Florida firm include Carl W. Lemmerman, president, Edward W. Legier, vice-president, and Lee Voyce, Jr., secretary.

Complete your shop with this modern metallizing installation



WIRE GUN

Sprays any metal
that can be drawn
into wire form.

POWDER GUN Sprays hard-facing alloys and ceramics in powder form.



Without metallizing no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard facing alloys including tungsten carbide.

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- Do your own hard-facing at high speed, low cost
- Apply long-wearing, corrosion-resistant coatings

A real opportunity for the smaller shop

Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.



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Flame Spray Equipment and Supplies 2035 Lafayette St., New Orleans 16, La. Telephone EXPRESS 3232



gives you all these features for your forged steel pipe union requirements



- 1. Uniform walls for even expansion and contraction under temperature changes. They follow the pipe!
- 2. Catawissa Ball-to-Angle Seats give you a "Perfect Seal" regardless of pipe alignment!
- 3. More than adequate wall thicknesses give you Catawissa's 3-to-1 Safety Factor (3000-lb, service, 9000-lb, test; 6000-lb, service, 18000-lb, test)!
- 4. Round, straight barrels for fast wrenching. No uneven or tapered surfaces to cause wrench slips or wrench locking!

Catawissa Perfect Seal Pipe Unions are made by Union Specialists from 80,000 lb, tensile strength steel (ASTM Spec, A-105-55T, Grade II). Steel forgings from our own forging mill are closely checked for imperfections . . and finishing on modern, automatic machines with close inspection during and after production give you pipe unions second to none!

Write for Catalog 58 showing the complete Catawissa line of Perfect Seal Products.

for complete, guaranteed satisfaction



CATAWISSA VALVE & FITTINGS CO.

CATAWISSA • PENNSYLVANIA

NEW Product Briefs

. . . there is always a BETTER WAY

Portable pH Meter

R-1 Analytical Measurements, Inc., Chatham, New Jersey, announces a new pH meter which weighs only 5 lb and can be used wherever a standard 115 volt a-c outlet is available.



The Model 700 big scale pH meter features a single operating control and a high output electronically modulated amplifier, with printed circuitry and sensitive meter elimination. The originally designed polyethlene electrode probe unit permits the user to "bring the meter to the sample — not the sample to the meter." It may be used to make pH readings anywhere on the production line and is not confined to the laboratory.

Two-Way Radio for Repairmen

Available from General Electric Communication Products Department, Lynchburg, Va., and designed to meet the needs of electrical contractors, utility crews and others who want to keep their two-way radios on to hear calls but who do not want to run their engines, is a new Transistorized Progress Line mobile communications unit which requires only one twenty-fifth of an ampere when used for this type of "standby" activity. Power consumed while standing by waiting for a call to be received at full volume is only .04 of an ampere. This is less, G-E says, than the amount of current used by an automobile clock.



Wall Deslagger

R-3

A new air-powered wall deslagger that completes a normal cleaning cycle in less than 73 seconds has been announced by Copes-Vulcan Division.

Blaw-Knox Company. Erie 4, Pa. This high-speed operation is made possible by two separate air drives. One extends and retracts the nozzle almost instantly. The other rotates the nozzle slowly for thorough cleaning. Standard nozzle travel is 12 inches, and 24-inch travel is also available.

Each deslagger in a sequence can operate in quick succession, so that the sequence can be repeated as often as needed for the desired results. The blowing medium may be air, saturated or superheated steam, or any combination of these media.

Durolite Block

R-4 for use with 1-in. dacron, nylon, manila and polyethylene rope is now available from Sauerman Bros., Inc., Bellwood, Ill. The new block weighs only 27 lb.



It is equipped with tapered roller bearings, has a wide flange sheave and wide throat housing.

The blocks can be furnished with rope bearing swivel eye, pin bearing swivel eye or swivel hook. One of the throat pins may be replaced with a toggle eye bolt for quick opening of the gate without tools.

All Static Control

R-5 "Static Slipsyn" starter, for application on all voltage synchronous motor starting equipment is now available from Westinghouse Electric Corporation.



The circuitry employs all static components and performs complex logic operations, including: application of motor-field excitation at both the proper speed and the most favorable rotor and stator relationship; detection and removal of excitation if the motor pulls out of synchronism; and protection of the starter or damper winding from overheating when operating at subsynchronous speed.

With this new starter, the motor field can be applied accurately up to 99 per cent of synchronous speed. Also, pull-out protection is now adjustable from 1 to 8 poles of slip, eliminating tripping due to transients.

Overhead Handling

R-6

To solve a headroom problem either due to low ceilings or where loads must be lifted high in order to clear other objects, The American Mono-Rail Co.. Cleveland 17, Ohio, brackets the hoist in a special carrier upwards between two crane bridges which are also mounted upwards between the two craneways.

By this means the hoist hook is



raised to the same level as the bottom flange of the crane bridges and the overall headroom dimensions of the crane bridge and carrier are held to a minimum of less than two feet depending upon the span and capacity of the hoist.

Another advantage, in addition to maximum clearance above and beneath the crane, is that there can be longer crane spans because of the stiffening effect of the two bridge beams. Drive units can be hand chain or electric power operated.

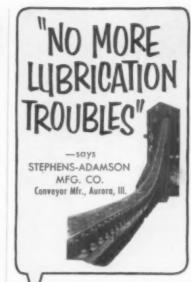
Combination Regulator

R-7 New combination temperature and pressure regulators are now available from OPW-Jordan Corp.. Cincinnati 13, Ohio, in ½"-2" sizes, Used to



control temperature and pressures with only one regulator in the main line, the regulator eliminates the need for two separate installations, simplifies piping, gives better constitution and is less costly. It anticipates temperature change through a pressure sensing mechanism.

Sliding gate seats are self-cleaning and self-lapping in operation. The regulator accurately controls temperatures from 35-450 F.



V "Lubriplate Lubricants satisfy the 'one-shot' requirements of our conveyor idlers. Lubriplate effectively lubricates each bearing in turn and flows through the hollow shaft to the next bearing. We do not know of a single case of bearing trouble through faulty lubrication where Lubriplate has been used."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.



For nearest Lubriplate distributor see Classified Telephone Directory, Send for free "Lubriplate Data Book" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.



ON GUARD



5 gal. pail Easy to apply With Natural Rubber

FOR FOOL-PROOF ROOF PROTECTION

New! A rubberized, liquefied, asphalt sealing compound of unexcelled quality. "Black Mask" covers surfaces with a thick, durable "rubber raincoat" that defies the elements. Silk-like strands of flexible, durable NATURAL RUBBER, interwoven with specially refined and oxidized HIGH MELT POINT ASPHALT, aids materially in retarding condensation on all treated structures, Ideal for Roof, Masonry Walls, Foundations.

Gardner MOBILASTIC ALUMINUM ROOF COATING

Sunsational! The superior brilliancy of this product reflects and disperses up to 75% of the sun's actinic rays. Interiors become cool and comfortable during the "long hot summer." High Aluminum pigment content plus the finest grade asphalt insure an extra thick, quality top-coat. Insulates, waterproofs, prevents rust and corrosion as it repels heat. Provides a protective shield for the under-body of asphalt. Apply with brush or spray.

Gardner SILICONE WATERPROOFING

Superior! A full strength Silicone waterproofing for cement buildings. Designed specifically for southern climates.

> Call or Write for details, today!

GARDNER ASPHALT PRODUCTS CO.

912 RUBY ST., TAMPA, FLORIDA

Manufacturers of Quality Roofing, Waterproofing & Flooring Compounds for Home & Industry

New Product Briefs (Continued)

Pneumatic Grinder

R-8 Company, Springfield,
Ohio, has added several
improvements to its Model 600-V
Vertical Pneumatic Grinder.



This light, compact grinder is now available with a revolving wheel guard which provides greater protection for the operator, and permits better observation of work. If preferred, a stationary, adjustable wheel cup guard is available.

Designed for medium duty grinding, sanding or wire wheel work on any flat or curved surface, the grinder can now also be provided with a 7" or 9" depressed center disc wheel as well as a 6" abrasive wheel or brush.

Winding Protection

R-9
U. S. Electrical Motors Inc.,
Los Angeles 54, Calif., has
developed a new special
protection for windings functioning
under adverse environmental con-



ditions where conventional motor insulations have short life expectancy. The new protection is trademarked under the name "Everseal," and is now available on all U. S. Motor types.

Molded in rigid high-grade resin, Everseal encapsulated windings are fully protected against the attacks of excessive moisture, acids, and gases (even in high concentrations); alkali or caustic conditions (lye, potash, ammonia, caustic soda); abrasives, carbon black, graphitic dusts, and other contaminants.

Epoxy Repair Compound

R-10

Devcon Corporation, Danvers, Mass., has introduced a new low cost epoxy tooling and repair compound. Two types are available, Devcon 100 — a putty like material, and Devcon 101 — a liquid.

Both materials have good tensile and compressive strength, resist most chemicals and oils, and will bond to all types of metals, wood, ceramics and other materials. Each unit is packed complete with exact amount of hardening agent, sufficient release agent, and complete instructions.

Foamed Plastic Pipe

R-11 Armstrong Cork Company,
Lancaster, Pa., announces
major improvements in its
foamed plastic pipe covering insulation, which give it a higher temperature range, complete ozone resistance and smoother surface for easier
handling and better appearance.

The improved product, called Armaflex 22, is widely used on liquid cooling and heating lines, chilled water lines, and other cold lines in industrial processing applications. It can be used from below zero up to 220 F.

General Purpose Electrode

R-12

A. O. Smith Corporation,
Welding Products Division,
Milwaukee, Wisc., has developed a general purpose welding
electrode that cuts spatter loss up
to 60 per cent. The new SW 612 mild
steel electrode is a high rutile type
for heavy or high-speed production
welding where fit-up is poor.

Dissolved Oxygen Test

R-13

Testing of low concentrations of dissolved oxygen in boiler feedwater now can be performed easily by inexperienced boiler operators. The new, quick test, accurate to within two parts per billion of oxygen, is possible with a Colorimetric Test Unit being marketed by Hagan Chemicals & Controls, Inc., Pittsburgh.

Six permanent color standards in sealed tubes represent 0, 5, 10, 15, 25, and 50 parts per billion oxygen. Differences in color shades make estimations accurate to the nearest two parts per billion between zero

and 15 parts. To analyze for dissolved oxygen, a boiler operator draws water into the sampling tube placed in a special container. Leuco Solution, a mixture of indigo carmine-dextrose dye and a potassium hydroxide solution, is added to the tube under water. The tube then is removed from the container and the color compared to the six permanent standards.

Valve Manifold

R-14 Chestnut Hill, Philadelphia 18, Pa., has introduced a simpler and more dependable means of making instrument con-



nections to flow meters, level indicators, and other types of instruments.

The new Yarway Manifold combines three valves in a single body—two providing suitable line shutoff and one that equalizes pressures to protect the instrument's internal working parts—together with a connection tap for calibration of the high pressure side of the system.

Aluminum Coating

R-15

The Wilbur & Williams
Co., Inc., 650 Pleasant St.,
Norwood, Mass., is marketing a high-sheen, rust inhibitive aluminum finish for fences, tanks,
standpipes, etc. Called "Totalume,"
this protective finish is formulated
specifically to retain a high lustre
under the severest conditions; it
withstands temperatures up to
1000 F. The finish can be painted
over damp or rusted surfaces safely
and easily.

Diamond Drills

R-16

Two new industrial diamond drills with optional, interchangeable air and clectric drives have been introduced by the E. J. Longyear Company, Minneapolis 20, Minn.

The Model "330" is a swivel drill, 6-inch capacity, that drills holes at any angle through reinforced concrete, brick, tile, or stone. It swivels in two directions, raises and lowers on a column attached to its base or can be taken off its base and mounted on a column or horizontal crossbar.

The Model "305" is a lightweight vertical hole drill, also of 6-inch capacity. For horizontal drilling, the screw feed mechanism can be removed from the base and anchored to the wall.

Property Tags

R-17 City, Iowa, is offering adhesive-back, aluminum property tags designed to aid in plant property control. The serially numbered "Autographs" bear company identification to be affixed to all furniture, fixtures and equipment; individual record cards file pertinent data about each asset.

The tags can be mounted on curved surfaces as well as flat ones. Strength of the bond increases with age. Shelf life is estimated at 18 to 24 months. A "try before you buy" kit is available from the manufacturer.

Heat Resistant Paint

R-18

A high heat resistant paint, which protects steel jigs, fixtures and formed products during brazing and welding operations, is announced by Speco, Inc., Cleveland, Ohio.

Known as Heat-Rem H-170 Super, the paint is said to withstand temperatures to 1700 degrees. It is available in both aluminum and clear vehicles. In addition to spray application, the paint may be used for dipping or brushing.



Webster BUILDS BOTH



WEBSTER ENGINEERING

Division of Midland-Ross Corp.
TULSA 9, OKLAHOMA



SARCO

Inside story on automatic cooling control



Simple, gadget-free design, Fully modulating. Sensitive liquid-filled thermostat gives you uniform movement of valve for each degree of temperature change, at all points on the range. Packless — no stuffing box — no leaks — no valve stem jamming. Self-contained — no part of mechanism exposed. Dependable and inexpensive — thousands in service. So reasonable in cost, you can afford Sarco automatic cooling controls for every application.

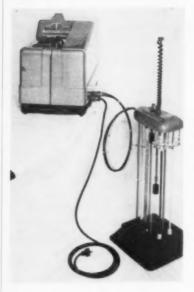
Sarco T-44 self-powered cooling control is available in standard 50° adjustment ranges: 60-110° F., 85-135° F., 110-160° F. and 135-185° F. Sizes: 3s", 34", 12" and 1".

For the full story on Sarco Cooling Controls...

contact your Sarco sales representative or district office, or write—



New Products (Contd.)



Automatic Fluid Testing

R-19

An automatic fluid testing instrument with unusually broad potential has been developed by Graver Water Conditioning Co.. a division of Union Tank Car Co. Now used to monitor ultra-pure condensate at utility power plants, the instrument can also be used to check the purity of industrial power plant feedwater; process, rinse and waste waters, and liquids of many types.

A distinct possibility for the instrument is quality control testing of manufactured products, including chemicals. The instrument can indicate by color variation the proper ingredient content.

Projected modifications can render the analyzer useful in sampling air and gases, detecting radio-activity in municipal water supplies and other liquids, and monitoring soluble impurities as it now monitors insolubles.

The device is based on the widely used Millipore Filter test method in which particulate material is quantitatively removed from a liquid or gaseous sample by an ultra-fine Millipore filter membrane and retained on the filter surface where it may be easily identified, sized, counted or tested.

The new tape analyzer automates the Millipore test by filtering samples in sequence as often as desired through a nylon-backed tape of Millipore Filter membrane and printing the time each sample is taken. The basic data produced is a circular stain or discoloration on the tape made by the solids extracted from the filtered fluid.

The degree of discoloration, proportionate to the insoluble solids concentration, can be calibrated by analyzing a portion of a sample and then running another portion through the tape analyzer. A stripchart recording attachment is also available.

The Millipore tape has an effective porosity of 450 millimicrons. It filters parts per billion trace solids such as iron and copper and shows distinctly on the tape concentrations as low as 2-4 parts per billion.

The analyzer is designed to control and monitor many phases of plant operation. On trouble-shooting, the analyzer can pinpoint the exact location of solids pick up. As a control instrument, it can measure the effectiveness of the filters and signal the need for cleaning. In condensate scavenging installations the instrument can measure, on a routine basis, the parts per billion purity of condensate.

The current Model 302, now in production and available on order, is a basic unit which potentially can be modified in many ways to extend its usefulness. It weighs only 70 pounds and is readily portable to make readings at various locations.

FIRST CHOICE FOR PUMPS, VALVES and MIXERS..



Five braid over braid style numbers to choose from for reciprocating rods and plungers, slow rotary motion, shallow stuffing boxes, and

Get up-to-the-minute data in the Palmetto Self-Lubricating Packings Catalog and Price List. Ask for SLP-659R.

GREENE, TWEED&

Variable Impact Drill

R-20 S. Green Road, Cleveland 21, Ohio, has developed a new variable-impact electric drill, 18 inches long and weighing only 10¹/₂ pounds, reported to be capable of sinking a ³/₄" hole 3 inches deep in concrete in 180 seconds.

The variable impact force is derived from one axially-moving part, a spring-loaded hammer cam striking the drill chuck anvil twice on each revolution of the shaft. The adjustable feature of the drill, in addition to preventing carbide breakage, also permits controlled impact drilling of hollow tile and similar materials.

Stainless Steel Roofing

R-21 Middletown, Ohio, has announced a new roofing and siding material known as Deep Corrugated stainless steel. It is said to offer a saving in cost approaching 50 per cent, with reduction in weight exceeding this figure.

The material is especially recommended for industrial buildings, warehouses and other structures in areas where there are atmospheric corrosion problems. It is a departure from the 2½" x ½" nominal dimensions, having a 2 2/3" pitch and ½" depth.

Cost savings may be accomplished in any one of three ways: (1) design for typical purlin spacing and substantially reduce the gage of stainless; (2) maintain the gage and widen the distance between purlins, saving on the number of purlins; (3) a compromise can be made between gage and purlin spacing. The individual structure will determine which is most advantageous.

Fault Simulator For Television

R-22 Capable of introducing any combination of 36 different field-type troubles into an industrial television system has been developed by the Electronics Division of Diamond Power Specialty Corporation, Lancaster, Ohio.

The simulator capitalizes on the fact that many malfunctions can be partially or completely diagnosed by studying the monitor or viewing screen presentation.

It permits training under near field conditions. The malfunction simulator, under the control of the instructor, gives the service trainee maximum experience in recognizing the monitor indication of malfunctions, diagnosing the trouble stage and tracing to the defective component. A valid diagnosis by the trainee is immediately confirmed when the instructor switches out the malfunction.

WEEP UP-TO-DATE USE SPI READER SERVICE

Anti-Vibration Pad

R-23 by Lowell Industries. Inc.,
Boston 34, Mass. is a new anti-vibrational material designed to be placed under the base or feet of machines to prevent their transmission of vibration and noise to surrounding areas.

The material is simple to install—no lagging or cementing to the floor is necessary. Creeping or crawling of vibrating machinery is impossible on the pads because of the high co-

efficient of friction (0.8) and the vacuum suction cup pattern of the surface. In applications where leveling becomes necessary, leveling screws bear down on metal shims which are inserted between the foot or base of the machine and the Vibra-Check pad.

Asbestos-Cement Pipe

R-24 St., New York 16, N. Y., has developed a new Transite Underdrain Pipe.

Formed basically of asbestos fibers and cement, the dense uniform structure of this pipe gives it great crushing strength, making possible an economical wall thickness that assures an extremely good weightstrength ratio. Its smooth, uniform interior and resistance to corrosion assure low frictional resistance to flow of water.

The pipe provides a permanently tight yet flexible joint through use of mechanically exact plastic couplings. This type of coupling assures maintenance of proper alignment, and reduces the infiltration of silt and foreign matter.

WHEREVER YOU NEED TO COOL A FLUID... and have a problem of water supply or disposal...use NIAGARA "AERO"

▶ Evaporating a very small amount of water in an air stream you can cool liquids, gases or vapors with atmospheric air, removing heat at the rate of input, controlling temperature precisely. Save 95% of the cost of cooling water; save piping, pumping and power. You quickly recover your equipment cost.

HEAT EXCHANGER

You can cool and hold accurately the temperature of all fluids, condense

vapors, cool water, oils, solutions, intermediates, coolants for mechanical, electrical or thermal processes. You have a closed system free from dirt. You have solved all problems of water availability, quality or disposal, maintenance expense is low.

You may apply this to solvent recovery, vacuum systems controlling reactions, condensing distillates, cooling reflux products.

For more information, write for Bulletins 120, 124, 135. Address Dept. SP-6.

NIAGARA BLOWER COMPANY

Dept. SP-6, 405 Lexington Ave., New York 17, N. Y.

Niagara District Engineers in Principal Cities of U.S. and Canada

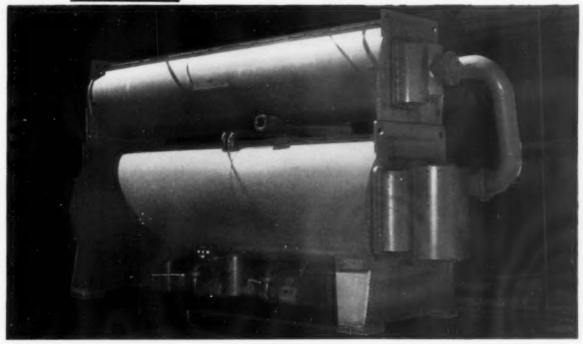
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PH ASB ATTESTOL CORP.				

Even boiler-cooled air conditioner faces the *Oldest* of maintenance troubles



Lithium bromide absorption systems need protection of their condenser cooling circuits

A popular development in air conditioners is the boiler-fed, water-cooled lithium bromide absorption system. It is economical and efficient, but since water plays a major part in its operation its maintenance problems are the same old onesmetal rusting, pitting, scaling and reducing efficiency to a point of complete breakdown.

Two ANCO products—Coolex and SR-2—can help you get and maintain top performance from your air conditioning system by neutralizing the effects of scale-forming and corrosive elements. Coolex and SR-2 keep rust and scale from forming and acting as insulators, from reducing heat transfer to an ineffective minimum. With the proper treatment program using these products the capacity of your system is maintained, operating costs are held to a minimum.

There are competent ANCO service representatives throughout the South who are experienced in all phases of water treatment and who will be glad to come by your office and give you the full story. Call or write to one of the offices listed below and we'll see that you get prompt attention. A simple maintenance program now may save you hundreds of dollars later, and there is no obligation on your part for talking with one of our men.

Write today and request an Anderson service engineer to make an analysis and recommendation on your plant's water treatment. There is no cost for this service.

SPECIALISTS IN MAKING WATER BEHAVE



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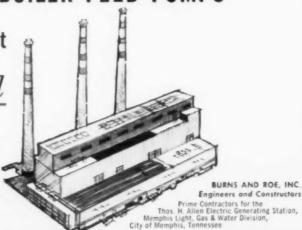
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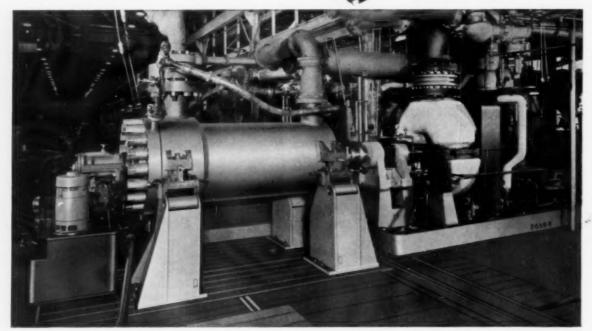
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performance-tested in our plant

Performance-proved

in Memphis...





One of nine City of Memphis 12-stage Pacific boiler feed pumps on performance test in Pacific's especially engineered testing laboratories. All nine pumps were completely tested at Pacific — are now on the line in the Memphis plant . . .

INSPECTION – Each and every part of Pacific Boiler Feed Pumps is inspected and checked prior to assembly. The finest precision gauges are used to check the accuracy of each part, to insure the proper fit during assembly as well as the proper fit when replacement parts are installed in the field.

HYDROSTATIC TESTS - Each part subject to internal pressure, whether forged or cast, is hydrostatic tested. This

includes such parts as the case, heads, jacketed packing housings and bearing housings.

PERFORMANCE TEST — PACIFIC's test laboratories are equipped with calibrated motors and instruments; a variable-speed steam turbine coupled to a torque meter. Closed tanks, vacuum pumps and all other equipment necessary accurately establish the complete performance characteristics of each pump. Test procedure for multi-stage pumps also includes a check of axial thrust.



PACIFIC PUMPS

Inc. . . A Division of Dresser Industries, Inc.

HUNTINGTON PARK, CALIFORNIA Offices in all Principal Cities

BF-29

